

The Bible, theodicy and Christian responses to historic and contemporary earthquakes and volcanic eruptions

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Theodicy is defined as the process of seeking to reconcile the reality of human suffering with the notion of a loving God. It is commonly associated with several models first proposed by Leibniz in the 18th century, though theodicy as an intellectual and religious pursuit is much older, with antecedents stretching back to biblical times. It is argued that within Christian theology 'divine retribution' is not only the most prominent theodicy within scripture, but is also the one most frequently adopted historically as the preferred explanation for losses and suffering caused by disasters, including those produced by earthquakes and volcanic eruptions. Contrary to what some historians of the earth sciences have maintained, we argue that in many societies with a Christian ethos there is little evidence to suggest that religious explanations have ceased to be important. The case is made that a model of 'divine retribution' is not merely a feature of biblical narratives, Christian history and pre-industrial societies, but also continues to guide the ways in which some, albeit a minority, of Christians interpret disaster losses today. An argument is advanced that other Leibnizian theodicies, especially the 'best of all possible worlds' model, are also supported biblically and have been increasingly adopted by Christians to explain disaster losses particularly since the 18th century. In recent decades the nature of theodicy has changed fundamentally. In some cases this has involved the development of theodicies such as the 'free-will defence' which have long existed within the Leibnizian canon, but in other instances theologians have moved beyond this tradition to produce what may be termed 'post-Leibnizian' models, of which the 'liberationist' is the best supported biblically and theologically. Close relationships between 'liberationist theodicy' and liberation theology, which is prominent in many economically less developed countries especially in Latin America, are discussed. Finally, the implications of 'liberationist' theodicy for Christian social action (i.e. praxis) and hazard planning are noted.

Keywords: Christian theology; disasters; earthquakes; theodicy; volcanic eruptions

1. Introduction

Nearly 40 years ago a seminal text, *Problems of Suffering in the Religions of the World*, was published (Bowker, 1970, pp. 137–165), in which it was argued that the issue of innocent suffering is a prominent theme in most of the world's religions. In Christianity and Judaism, in particular, arguments used to reconcile the concept of a loving and omniscient God, who treats his creatures with justice, and the simultaneous existence of evil and suffering is termed theodicy (Greek θεός – *theos* – God and δίκη – *dike* – justice).¹ The word theodicy was first introduced into philosophical

discussion by Gottfried Wilhelm Leibniz in 1710 (Leibniz, 1712, 1952; MacDonald-Ross, 1984, pp. 102–105), although attempts to understand the reasons why innocent people suffer have exercised the minds of philosophers and theologians for thousands of years, being a notable feature of: the Hebrew Bible (i.e. the Christian Old Testament); the New Testament; works of early Christian writers, in particular Augustine (354–430 CE)² and Irenaeus (c. 115–90 CE); and some of the greatest writers of later Christian history, including Immanuel Kant, David Hulme, Feodor Dostoyevsky, Karl Barth, C. S. Lewis, John Hick, Jürgen Moltmann, Alvin Plantinga, James

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Crenshaw and Dorothee Sölle (Hick, 1973, 1978; Sölle, 1984; Chester, 2005a). Although in recent years most discussions of theodicy within the Judaeo-Christian tradition have been concerned with the suffering caused by humans to humans (e.g. violence against the individual, warfare and genocide), there is an established tradition of studying what are termed natural evils, which include sickness and bereavement, as well as disasters following in the wake of extreme natural events (e.g. Farrer, 1966; Russell, 1994; Chester, 1998, 2005a; Chester and Duncan, 2007a, 2010).

Philosophical theology is based on the exercise of human reason, in the context of an

engagement with scripture which is perceived to be the revealed word of God, and within the Leibnizian tradition there are a number of models of theodicy which are either based on, or may be supported by, scripture (Table 1).

2. Scripture and the theodicy of retribution

Biblical narratives focus on the *Holy Land* – present day Israel/Palestine – but allude to a more extensive area covering lands that border the eastern Mediterranean and which encompass much of the Middle East. This large region is notable for its history of disasters, which include

TABLE 1 Leibnizian models of theodicy

Free Will or Augustinian (Lewis, 1944, 1961; Plantinga, 1974; Davis, 1981; Whitney, 1985)	Best of all Possible Worlds or Irenaean (Hick, 1973, pp. 40–42; 1978; Murphy, 2005)	Retributive (Schwager, 1987)
Suffering is related to the freedom granted to humankind by God. Suffering results from human activity and reflects human sinfulness. It does not reflect God's action and is contrary to God's will.	The universe is controlled by the laws of physics and not by special laws (i.e. providences). Despite the suffering caused by disasters, the earth is the <i>Best Possible World</i> (Leibniz) that could be created. Suffering occurs to achieve the <i>greater good</i> (e.g. without earthquakes tectonic activity would not be possible and without volcanic activity no atmosphere would have formed). The occurrence and magnitude of earthquakes and volcanic eruptions obey the laws of probability. Our 'law controlled' world facilitates spiritual growth, through dealing with suffering.	This is the principal scriptural model of suffering and one prominent in accounts of reactions to earthquakes and volcanic eruptions throughout most of Christian history. There are similarities with the dualist model.
Existential (Frankl, 1959; Dynes and Yutzy, 1965)	Chaotic (Barbour, 1990)	Dualist (Moltmann, 1983, p. 565)
Similar in some respects to the <i>best of all possible worlds</i> model. Good may come out of suffering and a decision has to be made to find meaning?	Post-Newtonian (i.e. uncertainty-based) view of natural processes. The world is intrinsically chaotic (Barbour, 1990). People have to plan to live with uncertainty.	Good and evil are opposites and in conflict and people must make a decision (similar to the <i>existentialist</i> model). Only good comes from God, evil and suffering from an 'anti-God' or Devil. Far less popular today than in the past, except in some strands of apocalypticism.

Note: Based on Dynes and Yutzy, 1965; Furnham and Brown, 1992, with amendments; Chester, 1998, p. 505; Chester and Duncan, 2010. The three principal models are the *Augustinian* (free-will), *best of all possible worlds* (Irenaean) and *Retributive*. The *Existential* model is closely related to the *best of all possible worlds* model and the *Chaotic* is a post-Newtonian development of the *best of all possible worlds* model.

droughts, storms and floods (Kempe, 2003), as well as earthquakes and volcanic activity. Frequent and damaging earthquakes have occurred in the Holy Land (Figure 1) and, although active volcanism did not occur in Palestine either during the biblical era or subsequently, it is a feature of several other areas mentioned in scripture (Figure 2).

2.1. The Hebrew Bible

Although the veracity of the creation narratives in Genesis 1–11 and the historicity of the biblical record more generally have been questioned since at least the first quarter of the 19th century and especially following the publication of works which include Lyell's *Principles of Geology* (Lyell, 1830) and Darwin's *Origin of Species* (Darwin, 1859), until the 1970s the consensus held that the Old Testament was a generally reliable source of information about Israelite history, in particular for the period following the Exodus from Egypt and the settlement of Palestine in the 13th century BCE (Bright, 1960). Before the Exodus it was accepted that the history of Israel was built on less secure foundations but, although events may not have occurred exactly as they are recorded in scripture, the general view was that there was little doubt that the Patriarchs – Abraham, Isaac and Jacob – were historical figures and that both settlement in and the Exodus from Egypt took place as documented. According to this traditional 'conservative' framework, up to 1,900 years separates the earliest oral traditions of the Patriarchs and the birth of Christ, with the Exodus taking place c. 1250 BCE (Drane, 1987, pp. 37, 57).

Over the past 40 years much of this received wisdom has been cast into doubt and questioning has been focused around the historicity of events which occurred before the fall of Jerusalem in 586 BCE and the exile of a significant portion of the population of Judea to Babylon (Davies, 2007; Williamson, 2007). Even if the veracity of earlier accounts is disputed, many centuries passed between the Exile and the events described

in the New Testament and during this time many earthquakes occurred within the Bible lands (Table 2). These and other disasters are frequently interpreted theologically. Additionally, even though some questions arise over the historical reliability of many earlier disasters, this is peripheral to the discussion, because putative earthquakes, volcanic eruptions and other disasters are still capable of being analysed theologically and have been since Old Testament times.

One of the earliest accounts in the Hebrew Bible concerns the destruction of Sodom and Gomorrah.

Then the Lord rained down burning sulphur on Sodom and Gomorrah. ... Thus he overthrew those cities and the entire plain, including all those living in the cities – and also the vegetation in the land. ... Early the next morning Abraham got up and returned to the place where he had stood before the Lord. He looked down toward Sodom and Gomorrah, toward all the land of the plain, and he saw dense smoke rising from the land, like smoke from a furnace (Genesis 19: 24–28).²

No trace has been found of the location of Sodom and Gomorrah (Bentor, 1989) and there has been considerable discussion about where the 'Cities of the Plain' were located. Though some early workers suggested that they were located north of the Dead Sea (see the discussion in Smith, 1896), there is now a general consensus that Sodom and Gomorrah were to be found on the eastern side of Southern Dead Sea Basin (Figure 1). Sodom was associated with bitumen pits (petroleum seeps) which were exploited as a valuable resource (Harris and Beardow, 1995). Petroleum seeps are associated with the fault that forms the eastern margin of the rift in the region of the Dead Sea (Figure 1), and today oil seeps from the base of the Nubian sandstone at Ain Umma on the east side of the Dead Sea about 4 km south of Wadi Mojib (Anon, 1943). It is considered that most of the seeps lie along the fault line just offshore from the east coast of the Dead Sea (Harris and Beardow, 1995), and the asphalt found floating on the surface of the

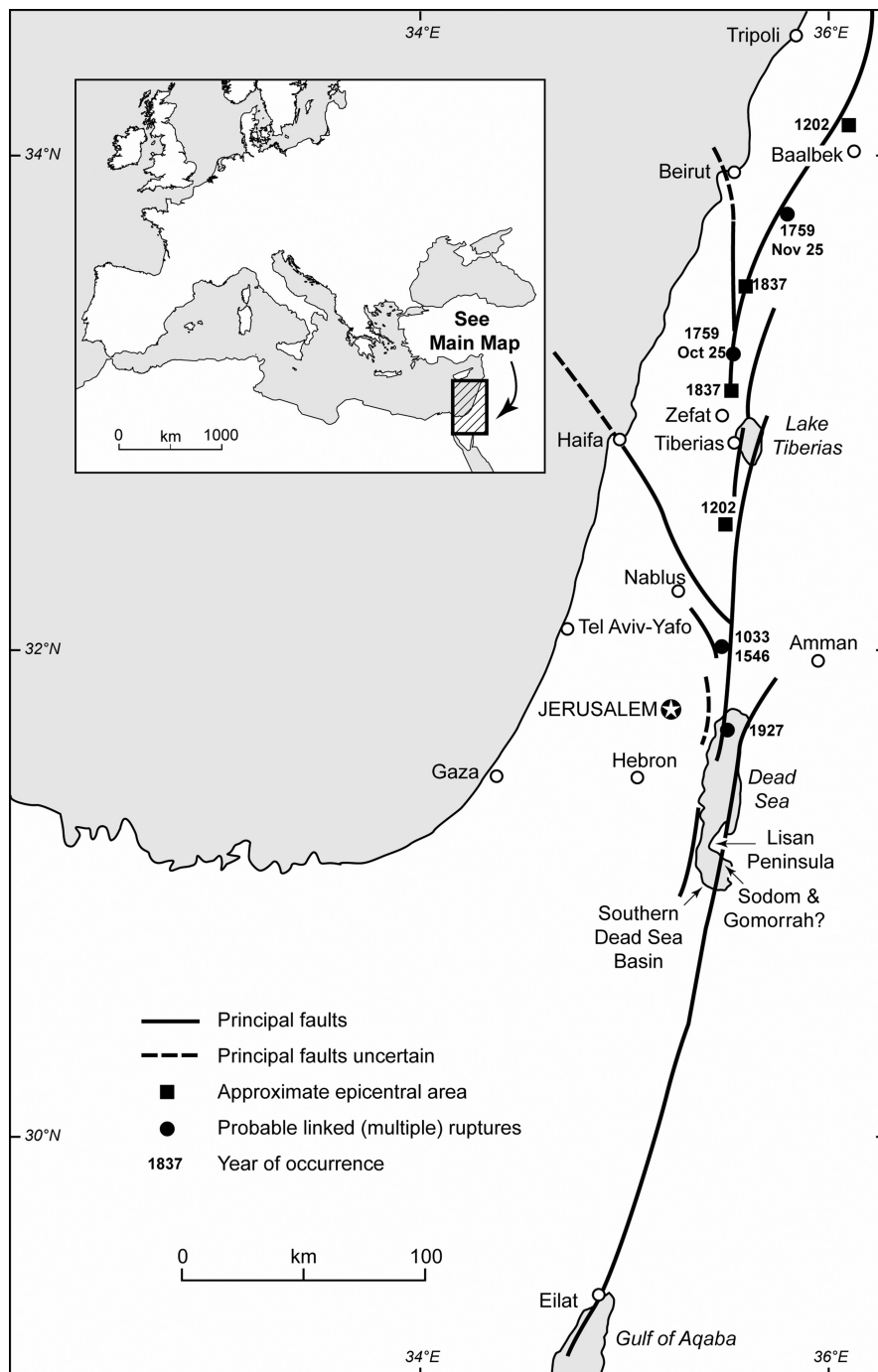


FIGURE 1 Active faults in the Holy Land

Source: The dates of large earthquakes (magnitude 6–7.5) that have occurred in the southern and central sections of the Dead Sea fault system during the last 1,000 years are added to illustrate the high degree of tectonic instability in the region (based on information in Degg et al., 2000, Figure 3, p. 7, and reproduced with the permission of the authors). The possible location of Sodom and Gomorrah is from Bentor (1989, p. 326).

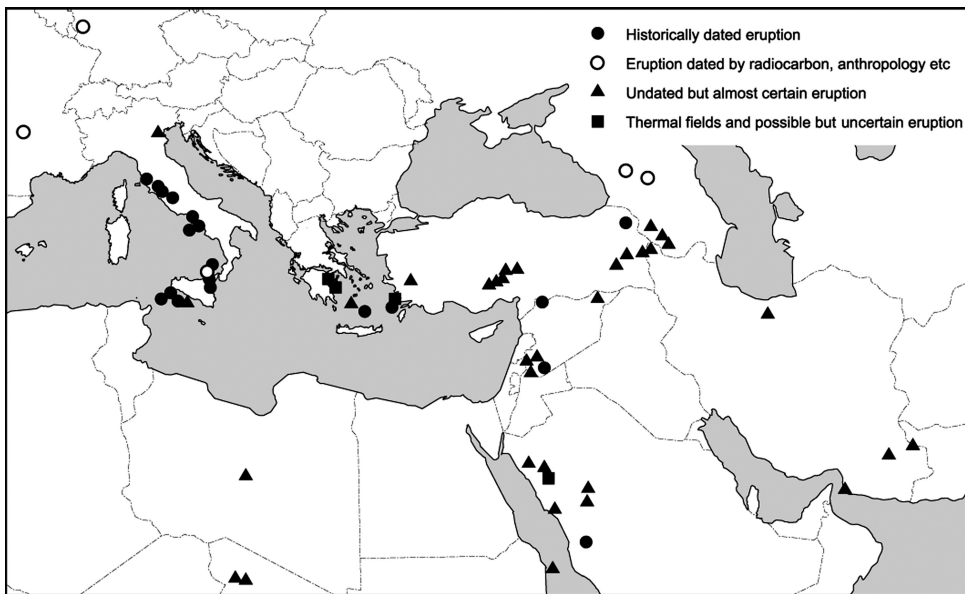


FIGURE 2 Volcanoes of the Eastern Mediterranean and Middle East which have been active during the Holocene (i.e. the last c. 10,000 years)

Source: Based on information in Simkin et al., 1981.

sea from biblical times was probably derived from these submerged seepages.

There is uncertainty regarding the date of the Sodom and Gomorrah event but it is probably older than 18th century BCE, with Neev and Emery (1995) placing an earthquake at c. 4350 BP.³ There is a general view that the event took place around the end of the Early Bronze Age III, approximately 4,000–4,300 years ago (Nissenbaum, 1994).

The nature of the Sodom and Gomorrah event raises considerable interest in the geological literature. The Biblical description refers to sulphur and fire raining down on Sodom and Gomorrah, the cities being overturned and the smoke of the land going up like smoke from a furnace. This description clearly reflects a sudden event. The Dead Sea Rift Valley is a seismically active region particularly along its Eastern Border Fault which runs along the east coast of the sea (Neev and Emery, 1995), and the description of the overturning of the city points to an earthquake. Some authors, for example Fritz Nötling cited in Smith (1896, p. 327), see

evidence of a volcanic eruption, but Smith argues that the observed phenomena do not agree with such an origin. More recently Trifonov (2007) has suggested that memories of the basaltic eruption of the Kra lava flow in southwestern Syria that destroyed Early Bronze Age settlements may have been conflated with the Sodom and Gomorrah event, giving rise to a vivid description. The distance between the two events in both space and possibly time, however, makes this link tenuous. More plausible is that an earthquake disrupted the petroleum seeps. This possibility was recognized by Smith (1896) and Emerson (1896) describes a similar event in 1857 in the San Gabriel Mountains in California to the north of Los Angeles, when petroleum seeps were ignited during the Fort Tejon earthquake (de Boer and Sanders, 2005, p. 35).

Harris and Beardow (1995), in their geotechnical analysis of the Sodom and Gomorrah event, place the cities in the Vale of Siddim in the northern embayment of the Lisan peninsula (Figure 1). They argue that water levels in the Dead Sea are likely to have been lower than at present and

TABLE 2 Reconstructions of extreme geophysical events recorded in the Hebrew Bible

Event	Description	Source ^a
31 BCE	In 31 BCE, when Herod the Great was King, a severe earthquake hit Galilee, although it had only a moderate effect on Jerusalem. The Jewish historian Josephus (c. 37–100 CE) estimated that around 10,000 people were killed.	Mariottini (1990)
64 BCE	A strong earthquake struck Jerusalem causing considerable damage to the Temple and walls of the city.	Mariottini (1990)
c. 6th century BCE	Earthquakes described in the Book of Job (e.g. Job 9: 5–6).	Bentor (1989)
c. 760 BCE	The effects of an earthquake and probably a tsunami are described by the prophet Amos (9: 6). This story may refer to an earthquake in the Mediterranean Sea. Tsunamis may be more common than is usually supposed. An earlier Holocene (c. 8,000 BP) event caused by a flank collapse of Mount Etna volcano (Sicily) into the Mediterranean, destroying the village of Atlit-Yam on the coast of Israel, has recently been proposed (Pareschi et al., 2007).	Bentor (1989)
c. 760 BCE	Evidence of this event is based on a correlation of the archaeological evidence of a possible earthquake that badly affected the city of Hazor in Galilee, c. 760 BCE and a recorded large seismic event which occurred when Uzziah ruled in the southern Kingdom of Judah and Jeroboam was King of the northern Kingdom of Israel (Amos 1: 1). So large was this event that it was still remembered some 450 years later (Zechariah 14: 5).	Bentor (1989)
c. 13th century BCE	The River Jordan was crossed and Jericho was captured by Joshua in the late 13th century BCE (Joshua 3–6). It is argued that this earthquake caused the banks of the river to cave in, an event that has also happened several times in the last 2,000 years, most recently in 1927. This event may also have also destroyed the walls of Jericho (Joshua 6: 20; see also Psalm 114: 3–8).	Bentor (1989); Nur and Burgess (2008)

Note: Dates are based on a traditional 'conservative' view of the historicity of the event described. Dates are from Drane (1987).

^aSee also Emerson, 1896; Neev and Emery, 1995; de Boer and Sanders, 2005; Krintzsky, 2005.

that many of the petroleum seeps currently underwater were at that time exposed at the surface and were possibly exploited for asphalt. If this was the site of the Vale of Siddim, then the cities would have been built on the coastal floodplain and alluvial fans derived from Wadi Kerak and these substrates are highly susceptible to processes of liquefaction (Harris and Beardow, 1995). Indeed liquefaction occurred during the 1927 earthquake at Jericho (Nur, 1991). Harris and Beardow argue that an earthquake and consequent liquefaction would have led to the catastrophic destruction of the cities. This interpretation seems to be the most plausible and, if correct, today Sodom and Gomorrah lie submerged off the Lisan peninsula. Nissenbaum (1994) proposes that increasing aridity at the

end of the Early Bronze Age III might have led to the abandonment of Sodom and Gomorrah, but this does not agree well with the descriptions which rather reflect a sudden and dramatic event. Increasingly hostile environmental conditions brought on by greater aridity may, however, have deterred resettlement of the area following the disaster.

The principal earthquakes and instances of possible volcanic activity that have occurred in later Old Testament times and which are mentioned in scripture are listed in Table 2, and the effects of these and other natural disasters are used by the authors of the Hebrew Bible to support its dominant theodicy: that disasters represent punishment of human sinfulness by an often wrathful God. In support of this

proposition many biblical texts may be quoted, of which the following cited by de Boer and Sanders (2005, pp. 22–23) are representative, though in several cases a close reading shows that some of these may be interpreted as merely instancing the extent and awesome power of the divine will.

Following the Exodus from Egypt, those who rebelled against Moses and Aaron were consumed by the earth. 'The earth opened its mouth, and swallowed them up, along with their households – everyone who belonged to Korah and all their goods' (Numbers 16: 32).

Then the earth reeled and rocked; the foundations of the heavens trembled and quaked, because he [i.e. God] was angry (2 Samuel 22: 8).

May the glory of the Lord endure for ever, may the Lord rejoice in his works – who looks on the earth and it trembles, who touches the mountains and they smoke! (Psalms 104: 31 and 32).

The foundations of the earth tremble. The earth is utterly broken, the earth is torn asunder, the earth is violently shaken. The earth staggers like a drunkard, it sways like a hut (Isaiah 24: 18–20).

The Lord is the true God; he is the living God and the everlasting King. At his wrath the earth quakes, and the nations cannot endure his indignation (Jeremiah 10:10).

The mountains quake before him [i.e. God], the hills melt; the earth heaves before him, the world and all who live in it (Nahum 1: 5).

He [i.e. God] stopped and shook the earth; he looked and made the nations tremble. The eternal mountains were shattered; along his ancient pathways the everlasting hills sank low (Habakkuk 3: 6).

Drawing on these quotations, the previous discussion and from other passages in the Hebrew Bible allows three summary statements to be made about the relationships between the divine will and human suffering (Crenshaw, 1983, 2005, pp. 117–131; Barton and Bowden, 2004, pp. 23–44).

1. The principal distinction is between the suffering of Israel – God's chosen people – and the suffering of individuals, and not between suffering caused by natural disasters and human agency.
2. The people who suffer are wicked and sinful, with God controlling alike the fates of people and nations.
3. For individuals the suffering of innocent Job is normative. Even Job's friends, Eliphaz the Temanite (Job 15), Bildad the Shuhite (Job 18) and Zophar the Naamathite (Job 20), cannot believe that he is totally innocent and must be harbouring secret sins. In this way Job's friends move from theodicy to 'anthropocopy', by endeavouring to 'force the issue into one of Job's sinfulness and thus away from God's culpability' (Nicholson, 1995, p. 76). Job resists this interpretation, however, protesting to God and pleading for vindication, 'but when God does eventually appear, it seems as if Job is cowed into submission. . . . God (being) depicted as allowing Satan to test Job's loyalty, which is then rewarded at the end by a restoration of his fortunes. Many modern readers find the book (of Job) deeply unsatisfying' (Young, 2000, p. 688),⁴ an opinion which has a bearing on later discussions in this paper.

In a much quoted article, Richard Bauckham highlights how authors in the Old Testament frequently make use of earthquake imagery to highlight *theophanies*, in which God is made manifest to his/her people. 'Frequently the creation shakes before the coming of God as warrior, leading his hosts to battle against his enemies (Judges 5: 4; Joel 2: 10; Micah 1: 4; Psalm 68: 7–8), before the coming of God to reign over the nations (Psalm 94: 1; 97: 5) (and) before the coming of God to judge the wicked (Isaiah 13: 13; 24: 18–20; 34: 4; Jeremiah 51: 29; Ezekiel 38: 20 and Nahum 1:5) (Bauckham, 1977, p. 224). In some Old Testament *pseudepigrapha*,⁵ Bauckham (1977) has also argued that texts point to a cataclysmic earthquake that will usher in a final manifestation of God at the end of time, an event which he names the

*eschatological theophany*⁶ (e.g. 1 Enoch 1: 3–9; Assumption of Moses 10: 1–7 and II Baruch 32: 1).

2.2. The New Testament

Although the Greek word *σεισμός* (*seismos*) is sometimes translated as ‘storm’ (*New International Version* – *NIV*) or ‘gale’ (*NRSV*) (e.g. Matthew 8: 24), the usual translation is earthquake and in this sense it is used 11 times in most English language translations of the New Testament. As in the Old Testament so in the New Testament, theophany and eschatology⁶ are prominent ways in which earthquake imagery is employed, with the ground-shaking that accompanied the crucifixion (Matthew 27: 54), the seismic activity which moved the stone from Christ’s tomb (Matthew 28: 2) and the earthquake that opened the doors of the prison in which the Apostles Paul and Silas were incarcerated (Acts 16: 26), all being examples of the former. Eschatological imagery (Smoller, 2000, pp. 163–164) is found in the Gospels (i.e. Matthew 24: 7; Mark 13: 8 and Luke 21: 11) and in the Revelation of St John the Divine (i.e. Revelation 6: 12; 8: 5; 11: 13; 11: 19 and 16: 18). Reference to a volcanic eruption may also occur in the Book of Revelation (Stauffer, 1955; Bauckham, 1977), where ‘hail stones [‘hail of stones’ according to Bauckham, 1977, p. 230]... dropped from heaven on people, until they cursed God for the plague of the hail’ (Rev. 16: 21), and this may be an allusion to fall deposits (i.e. tephra) from the 79 CE eruption of Vesuvius which most famously destroyed Pompeii. It is also noted by Stauffer (1955, p. 147) that ‘it was probably a devout Jew who scratched on the wall of a house in Pompeii the words “Sodom and Gemorrha (*sic*)”’. Even thousands of years later the Sodom and Gomorrah event was still being associated with destructive natural phenomena.

The events described in the New Testament occurred predominantly in the 1st century of the Common Era and explanations of suffering caused by natural and human agency display both a continuity with, and a development of, Old Testament *retributive* theodicy (Table 1). In Mark 2: 1–12 (paralleled in Matthew 9: 2–8 and

Luke 5: 18–26), before Jesus heals a paralytic he first forgives the man his sins (Mark 2: 5), so implying an Old Testament *retributive* theodicy. It is not made clear, however, whether this particular man was especially guilty because of his wrongdoing. The most focused treatment of the issue of human suffering and so-called natural evils occurs in two incidents that are recorded in the Gospels. In the first the disciples ask Jesus whether the cause of a man’s blindness from birth is his sin or that of his parents (John 9: 2), while in the second and referring to 18 people who have been killed due to the collapse of the Tower of Silo’am,⁷ Jesus asks the rhetorical question: ‘do you think they were worse offenders than all others living in Jerusalem?’ (Luke 13: 4). In the first incident Jesus upbraids the disciples and in so doing appears to go against Old Testament teaching, ‘neither this man nor his parents sinned; he was born blind so that God’s works might be revealed in him’ (John 9: 3), while in the second Lucan example Jesus answers his own rhetorical question, ‘no I tell you; but unless you repent you will all perish just as they did’ (Luke 13: 5). Both these passages are difficult to interpret. In the case of the blind man it seems undeserved – indeed iniquitous – that he should have had to endure suffering just so that he could be healed by Jesus (Young, 2000, p. 688), while in the Silo’am incident Jesus crucially introduces the notion of collective as opposed to individual guilt, a distinction which has important implications for present-day *post-Leibnizian* theodicy (see below).

3. Sin and divine retribution within historical disasters

In the period between the emergence of Christianity as a major world religion and the early 19th century, the explanation of major disasters that eclipsed all others was that these phenomena were either manifestations of divine power sent to punish human sinfulness and/or presaged the imminent end of the world. It is not difficult to support this statement, because the study of

historic disasters within societies with a dominant Christian ethos has generated a vast literature, a selection of which is summarized in Table 3.

3.1. *The conventional wisdom*

Making use of the literature on historic eruptions and earthquakes, the consensus of academic scholarship has been highly critical of the impact of Christianity and its *retributive* theodicy on human understanding of natural perils. The period between the rise of Christianity as the officially sanctioned faith of the Roman Empire under the Emperor Constantine and the later 18th century is considered a long 'Dark Age' in which superstition largely replaced the search for scientific explanations of natural phenomena. According to this reading of intellectual history, the spread of Christianity largely eclipsed the albeit nascent naturalistic explanations of volcanoes and earthquakes that had been proposed by writers in the classical age (Sachs, 1979; Sigurdsson, 1999, p. 71; Chester et al., 2000) and it was only from the time of the European Renaissance (Tyrrell, 1931), especially during and following the 18th century Enlightenment, that *retributive* religious explanations of disasters became less prominent (Sigurdsson, 1999); to be superseded progressively by more scientific and social scientific explanations of extreme natural events and their impacts on vulnerable populations (Jaggar, 1937a; Perret, 1950; Howell, 1990; Ben-Menahem, 1995). It is argued further that this change first occurred in Europe and North America and later spread to other parts of the Christianized world, with the 1755 Lisbon earthquake marking a watershed. Not only did this earthquake at the same time shock and fascinate the educated classes of Europe and North America, but it also stimulated a fierce debate between those who saw the hand of God in the subsequent disaster and those who proposed purely naturalistic explanations (Maxwell, 2007). Striking Lisbon and other areas of southern Portugal, southern Spain and North Africa on the morning of All Saints' Day (1 November),

many people attending church were killed by falling masonry and hundred of religious buildings were destroyed when fires were kindled by altar candles and houses collapsing on kitchen hearths. Such catastrophic losses led many commentators to ascribe the earthquake to divine wrath visited on the sinful people of Portugal, the group singled out for opprobrium being the people a particular writer wished to blame. For example, one Jesuit, Father Gabriel Malagrida, claimed the earthquake was punishment for the Inquisition not being sufficiently severe while, in contrast and writing from a Protestant viewpoint, John Wesley blamed the disaster on the Inquisition's excesses (Wesley, 1755; Kendrick, 1956).⁸ All these religious interpretations were strongly challenged by Jean-Jacques Rousseau (Bassnett, 2006, p. 323) who in the late 18th century was a pioneer in defining a disaster as a 'social construct', involving an interaction between an earthquake and a vulnerable population (Dynes, 2000, 2005; Chester, 2008).

Scholars embracing the conventional wisdom conclude by arguing that today the last redoubts of religious explanations of disaster are either to be found in extreme biblical-literalist⁹ Christian circles within economically more developed countries (EMDCs) (Hanska, 2002, p. 178), or in those societies within economically less developed countries (ELDC) which are relatively untouched by the forces of modernism.

3.2. *An alternative historical reading*

In order to test the veracity of this conventional interpretation of intellectual history, Table 4 has been constructed listing religious reactions to major earthquakes and volcanic eruptions that have occurred between 1900 and 2008 in countries with a predominantly Christian ethos. This catalogue represents an attempt to recover what has been termed a 'hidden history' (Chester and Duncan, 2007a, p. 212; 2010) of responses, because accounts which are cast in the 'language' of faith communities are frequently eliminated from official reports and

TABLE 3 Historical examples of earthquakes and volcanic examples being interpreted as portents of divine retribution

Middle Ages	<p>In Iceland, 'the fearsome noises that issued from some of their volcanoes were certainly thought to be screams of tormented souls in the fires of Hell below' (Sigurdsson, 1999, p. 75). In the 12th century Cistercian monks spread rumours that Hekla was the entrance to Hell. Its terrors were used to deter sinners (Blong, 1984, p. 175).</p> <p>Volcanic images of Hell were features of the writings of St Hildegard of Bingen (1099–1179) and are also to be found in Dante's <i>Divine Comedy</i> (1320) (Sigurdsson, 1999, p. 76; see also Smoller, 2000 and de Boer and Sanders, 2002).</p>
14th century	<p>In England during the 1380s recurrent pestilence, declining fortunes in war, the Peasant's Revolt of 1381 and finally an earthquake in 1382 caused many people to assume that a divine reckoning was imminent (see text for further details). The earthquake had an epicentre in the English Channel between Dover and Calais and it was claimed by one preacher that the world would end in 1400 (Aberth, 2001, pp. 4–5).</p>
16th century	<p>The 1580 London earthquake was alluded to by Shakespeare in <i>Romeo and Juliet</i>, a spate of pamphlets exhorted people to repentance, and a special prayer was commanded to be used in churches to calm the people.</p> <p>The prayer was last used in 1884 following the Colchester earthquake (Musson, 1994).</p>
16th and 17th centuries	<p>In Europe there were widespread apocalyptic expectations which were rooted in social and religious changes. Population was increasing for the first time since the Black Death, rural/urban migration was occurring and the Reformation and Counter-Reformation increased the number of perceived heretical Christians who could be blamed for the exercise of divine punishment. Diverse religious groups identified different figures as the antichrist (e.g. the Pope or Martin Luther). Natural disasters (especially earthquakes, floods and hailstones) were thought to be increasing in frequency and were equated with an imminent apocalypse. The Four Horsemen of the Book of Revelation 6 were associated with this forthcoming eschaton, with the Pale Horse particularly equated with death and disasters, both natural and human-induced (Cunningham and Grell, 2000, p. 82; see also Hanska, 2002).</p>
17th century	<p>The theme of a <i>Volcanic Judgement Day</i> was strongly developed in 17th-century puritan literature in North America (Dean, 1979, pp. 290–291). The Port Royal (Jamaica) earthquake of 1692 was widely interpreted as a sign of divine wrath. In London some commentators gave thanks that they had been saved (Thomas, 1971, p. 84; Gragg, 2000).</p> <p>The 1692 earthquake was felt in southeast England, France, Germany and the Netherlands. Many shared Bishop Burnet's interpretation that 'it has been happy for us if such dismal accidents (have made us aware of) a deep sense of the judgment of God' (Burnet, 1725, p. 384; see also Burns, 2002).</p>

Continued

TABLE 3 Continued

18th century	<p>Kaméni Islands eruption in Greece (1707–1711). As the Turks collected their tribute, a submarine eruption began and Christians started to pray and encourage their children to cry out <i>Kyrie Eleison</i> (Lord have Mercy) (Scarth and Tanguy, 2001).</p> <p>Following the Laki (Iceland) fissure eruption in 1783, much of western Europe was badly affected by adverse weather conditions and other atmospheric effects. In France a priest attempted to exorcize the dry fog, while in England many felt the <i>Day of Judgement</i> was at hand. William Cowper wrote, 'some fear to go to bed . . . and assert with great confidence that the day of judgment is at hand', and dismissed 'the fallibility of those speculations which lead men of fanciful minds to interpret scripture by the contingencies of the day' (Grattan et al., 2002, p. 98).</p> <p>Lisbon Earthquake (1755). Many commentators, not only in Portugal but also throughout Europe and North America, blamed this earthquake on divine wrath (Chester, 2008). From the perspectives of both theology and natural science this was one of the most significant historical earthquakes and is more fully discussed in the text.</p>
Early 19th century	<p>Following the New Madrid (USA) earthquake in 1811, many people were frightened about divine judgement and many 'backsliders' returned to the church, the Methodists alone gaining some 15,000 converts. Known as 'earthquake Christians', many later lapsed back into their old ways (Penick, 1981, pp. 116–117).</p>
Late 19th century	<p>The 1873 Venice earthquake (Italy) was controversially interpreted by Pope Pius IX as a scourge sent by God upon the spoilers of the church and revolutionary forces (Anon., 1873). This interpretation shocked the vast majority of Catholic commentators at the time, who saw the earthquake as a natural phenomenon.</p> <p>The 1884 Colchester earthquake (UK) was interpreted by some clergy in terms of punishment, but this was a minority opinion, with most recorded examples of preaching being much more finely nuanced (Haining, 1976).</p> <p>The 1888 Charleston earthquake (USA) was seen by some as a sign of God's wrath (Steinberg, 2000, pp. 10, 38).</p>
Italian volcanoes and earthquakes from the earliest Christian centuries to the 19th century	<p>Where records exist, virtually all major earthquakes and volcanic eruptions were associated with divine wrath visited on sinful people. Propitiation not only involved calls to change personal behaviour, but also elaborate rituals developed involving processions, prayers and the parade of saintly remains and votive objects (Chester et al., 2008).</p>

peer-reviewed international academic science and social science journals. Recovery of these records requires the interrogation of newspapers of record, use of more anthropologically based studies and the study of local archives. Notwithstanding these issues it is significant that, of the

61 discrete events recorded in Table 4, around 72 per cent show clear evidence of some responses being couched in religious terms, a figure that would probably be even higher if local records could be interrogated for information on earlier events. For example, reports of the 1902 and

TABLE 4 Religious reactions to *earthquakes (italic text)* and major volcanic eruptions (plain text) in countries with a predominantly Christian ethos, 1900–2008

Earthquake/Volcanic eruption	Religious response
1902 Mont Pelée, Martinique	Many victims saw the eruption as a punishment for personal and 'structural sinfulness'. ^a Confession of sins and prayer were major features of the response (Anderson and Fleet, 1903; Heilprin, 1903; Scarth, 1999, 2002).
1902 Soufriere, St Vincent	There is some reference to losses being due to divine action (Anderson and Fleet, 1903), but there are few details.
1905 <i>Calabria, Italy, magnitude 7.9 – deaths 2,500</i>	<i>There is some reference to losses being due to divine action, but there are few details (Anon., 1905).</i>
1906 San Francisco, California, magnitude 7.8 – deaths 3,000	<i>There is an extensive literature relating losses to divine retribution and punishment (Hartley, 1983; Fradkin, 2005; Winchester, 2006). Within the Catholic community masses were held and priests were engaged constantly in hearing confessions. One prominent priest publicly ascribed the earthquake to the wrath of God (Fradkin, 2005, pp. 213–214). Leaders of the Catholic and Protestant faiths formed a committee and held services to thank God for the preservation of the survivors. One leader of the Church of the Latter Day Saints^b initially interpreted the earthquake in apocalyptic terms, and many Protestant leaders drew a direct link between individual sins, the sins of the city and the disaster (Hartley, 1983, pp. 432, 457).</i>
1906 Valparaiso, Chile, magnitude 8.2 – deaths 20,000	<i>There is some reference to losses being caused by divine action, with people praying for forgiveness (Anon., 1906).</i>
1906 Vesuvius, Italy	There is an extensive literature relating losses to divine punishment. As in many Italian disasters, God is viewed as an agent of death and destruction, who had to be appeased through intercession, confession and by the parade of saintly relics and images (Perret, 1924; Scarth and Tanguy, 2001, p. 15; Chester and Duncan, 2007b).
1907 Kingston, Jamaica, magnitude 6.5 – deaths 1,600	<i>There is some reference to losses being due to divine action (Anon., 1907; Fuller, 1907, pp. 704, 793). People interceded for divine mercy and God's help.</i>
1908 Messina, Sicily, Italy, magnitude 7.2 – deaths 70–100,000	<i>There is an extensive literature relating losses to divine action (Anon., 1908). Statues of saints were carried in procession accompanied by prayers invoking the mercy of God. Local priests called on people to reflect on the extent of their sins (Bosworth, 1981, p. 194). Divine wrath was not, however, the way in which the major loss of life was interpreted in a memorial service for the victims held in London, where the earthquake was viewed as a wholly natural process (Anon., 1909).</i>
1911 Taal, Central Philippines	There is some reference to losses being due to divine action, but this is not spelt out in detail (Worcester, 1912).

Continued

TABLE 4 Continued

<i>Earthquake/Volcanic eruption</i>	<i>Religious response</i>
1915 Avezano, Italy, magnitude 7.0 – deaths 29,980	<i>There is reference to losses being due to divine action (Anon., 1915a,b, 1930a). Retribution by God was ascribed either to the violence of WWI (i.e. by Christian pacifists), or to the licentious behaviour of young people (i.e. Cardinal Ascalesi, Archbishop of Naples). The disaster also brought forth a major charitable effort by the Catholic Church (Anon., 1915a,b, 1930a).</i>
1930 Italy, magnitude 6.5 – deaths 1,430	<i>There is widespread reference to losses being due to divine action. According to the Cardinal Archbishop of Naples it was punishment for loose conduct, an interpretation which caused some consternation outside the affected area. Cardinal Minoretti saw it as a divine corrective, caused by moral disorders and shameful fashions (Anon., 1930a; 1930b).</i>
1931 Nicaragua, magnitude 5.6 – deaths 2,400	<i>There is some reference to losses being due to divine action. Allusion to retribution is present, but is not fully developed within contemporary accounts (Anon., 1931; Baltodano, 2004).</i>
1937 Rabaul, Papua New Guinea	<i>There is an extensive literature relating losses to divine action (Jaggar, 1937b; Johnson and Threlfall, 1985). There was a complex syncretic relationship between Christianity and indigenous religions. Some victims were not certain whether the Christian God or the local deity, 'Kaia', was responsible, but they continued to pray regardless.</i>
1940 Romania, magnitude 7.3 – deaths 1,000	<i>There is reference to losses being due to divine wrath. This earthquake was used by Adolf Hitler and his Romanian Nazi supporters to claim that God was on their side. God, it was claimed, was punishing the people of Romania (Anon., 1940).</i>
1943–1952 Parícutin, Mexico	<i>There is an extensive literature relating losses to divine intervention (Nolan, 1979; Scarth, 1999, pp. 145–146). People prayed, interceded and placed great store by a venerable crucifix, <i>El Señor de los Milagros</i> (Lord of Miracles), and its claimed ability to propitiate God's wrath.</i>
1944 San Juan, Argentina, magnitude 7.8 – deaths 8,000	<i>There is some reference to losses being due to divine action. The government relief effort made General Peron a national figure. Catholic elites saw the earthquake as God's way of making his people humble in the face of destruction (Healey, 2002).</i>
1944 Vesuvius, Italy	<i>There is an extensive literature on religious responses to this eruption. These responses included prayers and the use of relics and statues to appease God's wrath, including the parade of an image of the patron saint of Naples, St Genarro (Chester et al., 2007, 2008).</i>
1949 Ambato, Ecuador, magnitude 6.8 – deaths 6,000	<i>There is some reference to losses being due to divine action. Prayers of intercession were noted (Anon., 1949).</i>

Continued

TABLE 4 Continued

<i>Earthquake/Volcanic eruption</i>	<i>Religious response</i>
1951 Lamington, Papua New Guinea	There is an extensive literature relating losses to divine action (Belshaw, 1951; Ingleby, 1966; Schwimmer, 1969). Some people claimed the eruption was a punishment because the people had disobeyed the local Anglican (i.e. Episcopalian) bishop and had not built new churches. Others believed that God was punishing them for such things as: not supporting Christian mission; government plans for development; and not helping the allies during WWII (Ingleby, 1966, p. 30).
1951 Hibok-Hibok, Camiguin, Philippines	Older people blamed the eruption on God's displeasure at younger people growing lax in their churchgoing, neglecting feast days and forgetting the sign of the cross (Anon., 1951).
1953 Ruapehu, New Zealand	There is some reference to losses being due to divine action, but clergy focused on pastoral work and prayer (Anon., 2003a, 2003b).
1960 Chile, magnitude 9.5 – deaths 5,700	<i>There is some reference to losses being due to divine action (Kovach, 2004, p. 38). Prayers of intercession are noted (Anon., 1960).</i>
1968 Arenal, Costa Rica	There is some reference to losses being due to divine action (Alvarado-Induni, 1993).
1970 Peru, magnitude 7.9 – deaths 66,000	<i>Intercession is noted in several accounts. In the high Andes, a region particularly badly affected by the earthquake, victims perceived the disaster in terms of divine punishment. In contrast, some Catholic writers and theologians viewed the disaster in liberationist^a terms (Anon., 1970; Bode, 1977; Sagav, 1979; de Boer and Sanders, 2005).</i>
1972 Managua, Nicaragua, magnitude 6.2 – deaths 5,000	<i>Losses were frequently interpreted as being due to God's will. 'Structural sinfulness'^a was articulated by Latin American bishops meeting at Medellin (Dobson and O'Shaughnessy, 1990, p. 124) and some theologians interpreted the earthquake in these terms.</i>
1973 Heimaey, Iceland	<i>'It has been said that disaster will return to the island when three things happen – the village expands beyond the Hasteinn (high stone), the well runs dry, and the son of a bishop becomes minister of the church. By January 1973 the expanding town had passed the Hasteinn, the well had been filled in after a small girl had fallen into it and died, and the son of a bishop had just been appointed to the island' (Clapperton, 1973, p. 500). Some interpreted the eruption in these terms.</i>
1976 Guatemala, magnitude 7.5 – deaths 2–3,000	<i>Divine responsibility was a widespread reaction, with many instances of people claiming the earthquake was due to divine retribution. Much rivalry between Catholic and Protestant groups in aid provision. Some instances of praxis are cast in terms of 'liberation theology'^a (Pringle, 1976; Plant, 1978; Shea, 2001; Levenson, 2002).</i>

Continued

TABLE 4 Continued

<i>Earthquake/Volcanic eruption</i>	<i>Religious response</i>
1976 Friuli, Northeast Italy, magnitude 6.5 – deaths 1,000	<i>There is some reference to losses being due to divine action (Anon., 1976; Geipel, 1982).</i>
1976 Mindanao, Philippines, magnitude 7.9 – deaths 8,000	<i>There is some reference to losses being due to divine action (Bankoff, 2004).</i>
1977 Romania, magnitude 7.2 – deaths 1,500	<i>Even after many years of communist rule, there was still some reference to God being involved in the earthquake and in helping people to recover from the losses caused by the earthquake (Armas, 2006).</i>
1980 Southern Italy, magnitude 6.5 – deaths 3,000	<i>There is reference to losses being caused by divine punishment. Other commentators, held to a model of 'structural sinfulness'^a (Anon., 1980; Nichols, 1985).</i>
1980 Mount St Helens, USA	<i>There is an extensive literature relating losses to divine action (Tiedemann, 1992).</i>
1985 Mexico City, Mexico, magnitude 8.0 – deaths 9,500	<i>There is some reference to losses being due to divine action (Magnusson, 1985).</i>
1985 Nevado del Ruiz, Colombia	<i>There is an extensive literature relating losses to divine action (Bruce, 2001, p. 29).</i>
1986 El Salvador, magnitude 5.5 – deaths 1,000	<i>There is some reference to losses being due to divine action (Rutherford and Roux, 2002). Some people interpreted losses in terms of punishment for individual misconduct, but others recognized 'institutional sinfulness'^a (Jeffrey, 2001).</i>
1991 Pinatubo, Luzon, Philippines	<i>There is an extensive literature relating losses to divine action. Christian practice sometimes showed a syncretic relationship with animist practices. Losses were ascribed to divine anger over the development of geothermal power, the spread of pornography and other aspects of societal sinfulness (Banzon-Bautista, 1996; Newhall and Punongbayan, 1996; Scarth, 1999; Gaillard, 2003, 2006; Bankoff, 2004).</i>
1993 Galeras, Colombia	<i>There is an extensive literature relating losses to divine action. In Colombia there is often a syncretic relationship with non-Christian religions (Bruce, 2001).</i>
1997 Montserrat, Caribbean	<i>There is an extensive literature relating losses to supposed divine action (Huggins et al., 1997; Pattullo, 2000). Both 'retributionist' and 'liberationist'^a perspectives are present.</i>
1998 Papua New Guinea, magnitude 7.0 – deaths 2,183	<i>There is reference to losses being due to divine action. Great emphasis was placed on Christian praxis (Fountain et al., 2004).</i>
1999 Tungurahua, Ecuador	<i>There is some reference to losses being due to divine action, but few details are known (Tobin and Whiteford, 2002, Tobin, pers. commun.).</i>
1999 Colombia, magnitude 6.1 – deaths 1,185	<i>There is some reference to losses being due to divine punishment (Viveros, 2000).</i>
2001 El Salvador, Magnitude 7.7 – deaths at least 844	<i>Losses were interpreted in religious terms. Later Jon Sobrino (2004) worked out a 'liberationist theodicy' when reflecting on this event.</i>

Continued

TABLE 4 Continued

<i>Earthquake/Volcanic eruption</i>	<i>Religious response</i>
2002 Nyiragongo, Democratic Republic of Congo	There is some reference to losses being due to divine action. Some victims believed God had deserted the country (Anon., 2002).
2004, Sumatra, Indonesia, magnitude, 9.1 – deaths at least 180,000	<i>There is an extensive literature relating losses to divine action. Very complex and multi-faith religious reaction. Some Christians articulated a theodicy of punishment (Rigg, et al., 2005; de Silva, 2006; Sugirtharajah, 2006).</i>
Various dates	The persistent activity of Etna and Hawaii also shows frequent reference to losses being related to supposed divine action (Chester et al., 2008).
Earthquakes and volcanic eruptions for which there are no records of a religious response. See text for further discussion.	1902 Guatemala, magnitude 7.5 – deaths 2,000; 1902 Santa Maria, Guatemala; 1906 off the coast of Ecuador, magnitude 8.8 – deaths c. 1,000; 1929 Santa Maria, Santiaguito, Guatemala; 1939 Chile, magnitude 7.8 – deaths 28,000; 1946 Ancash, Peru, magnitude 7.3 – deaths 1,400; 1963 Skopje, Yugoslavia, magnitude 6.0 – deaths 1,100; 1963 Surtsey, Iceland; 1971 Villarrica, Chile; 1977 Democratic Republic of Congo; 1982 El Chichon, Mexico; 1986 Lake Nyos, Cameroon; 1987 Colombia-Ecuador, magnitude 7.0 – deaths 1,000; 1994 Nyiragongo, Democratic Republic of Congo; 1995 Rabaul, Papua New Guinea; 1995–1996 Ruapehu, New Zealand; 1996 Manam, Papua New Guinea.

Note: The highly destructive Indian Ocean (Sumatra) earthquake and tsunami of 2004 is also included because of the volume of discussion it produced among Christian commentators both within the countries affected and in the wider world. Data on magnitude and mortality are taken from the US Geological Survey (USGS, 2008), for earthquakes, and for volcanic eruptions from Tanguy et al. (1998) and Smithsonian (2008).

^aStructural sinfulness, liberationist, liberationist theology and institutional sinfulness are discussed in the text.

^bMany theologians would question whether the Church of the Latter Day Saints or Mormons is a Christian denomination (see Hanson and Hanson, 1981), because revelation is claimed other than through scripture and the person of Jesus Christ. They are included in this table because of their self-definition as being within the Christian fold.

1929 earthquakes in Guatemala show no evidence of religious responses, yet more detailed reports of the 1976 earthquake disaster show that religious explanations were at the time both deep-seated and of long standing within Guatemalan society.

One element of the 'conventional wisdom' that can be supported from Tables 3 and 4 is that a biblical-literalist *retributive* theodicy declined rapidly following the 1755 Lisbon earthquake, especially in what may be described today as economically more developed countries, though elements of it remain both in these societies and also in many which are

economically less developed. There are many examples of the latter in Table 4. In Great Britain and other countries which saw rapid industrial growth and major scientific advance from the late 18th century, progressively fewer Christians accepted explanations that involved divine *retribution* (Tables 3 and 4), but even today notions of divine wrath are still embraced by a small minority of biblical literalists and conservative evangelicals. Following the 2004 Indian Ocean earthquake and tsunami disaster, for example, a fierce debate raged in the religious press over the fact that a retributive theodicy was still being proposed by some Christians to

explain this event and its impact (Bradford, 2005). When faced with disasters that are perceived as being caused by processes that are more extreme than might be expected or have been experienced within living memory, there is a well-documented tendency for Christian commentators, who are normally most reluctant to invoke divine responsibility, atavistically to revert to a retributive theodicy. In commenting on the British floods of 2007 some prominent Christians, for instance, drew a direct link between British sexual lifestyles, divine judgement and the flooding, although subsequently Graham Dow, Bishop of Carlisle and the most prominent Christian quoted in the press as holding such opinions, provided a more finely nuanced statement in partial rebuttal, by claiming he had been inaccurately reported (Dow, 2007). Nevertheless, other letters in the religious press did not think that Bishop Dow went far enough in rejecting a retributive explanation (Ashby, 2007).

A *retributive theodicy* with liturgies of propitiation, parades of sacred relics/votive images and numerous other ritualistic actions to appease divine wrath is also still a feature of what has been termed *popular Catholicism* as encountered in places as diverse as: southern Italy and Sicily (Chester et al., 2008); on the slopes of Popocatepetl (Mexico), where there is a syncretic relationship between Catholicism and earlier pre-Columbian faiths (Plunket and Urnuela, 1998); and following the earthquakes in El Salvador in 1986 and the 1991 Pinatubo volcanic eruption in the Philippines (Table 4).

4. Disasters and other Leibnizian models of theodicy

Although, within the context of disasters, retributive theodicies are far less common today than they were in the past, there is no evidence to support the contention that naturalistic explanations of death, injuries and destruction have completely replaced those grounded within religious frames of reference in countries where

many (or most) inhabitants profess a Christian faith (Table 4). What is evident is that other models of theodicy, while not fully superseding the retributive, have become more common. Although all the theodicies listed in Table 1 have been employed in discussions of human-induced suffering, in studies of natural calamities the *best of all possible worlds* (i.e. *Irenaean*) model (Table 1) has been particularly important.

A *best of all possible worlds* theodicy is most commonly associated with Voltaire and his reactions to the Lisbon earthquake of 1755. In the novel *Candide* and in his poem *Le désastre de Lisbonne*, Voltaire alludes to a *best of all possible worlds* theodicy and is clearly of the opinion that destructive forces are built into the very structure of the universe, with Dr Pangloss – Candide's tutor – accepting Nature's fate even when faced with almost complete devastation. Summarizing this model of theodicy, Murphy (2005, p. 345) concludes that, it 'would probably be impossible to design any system of nature which did not have the potential to injure unsuspecting humans' and that God's purpose is to accept disasters and use them to complete a greater good (Table 1).

The association of the *best of all possible worlds* theodicy with St Irenaeus correctly implies that it pre-dates Voltaire and in fact it finds support in scripture, in the history of Christian responses to disasters (Table 3) and in the records of events that have occurred since 1900 (Table 4). Although the Hebrew Bible is generally unwilling to admit that there can be any wholly innocent suffering, some biblical scholars have argued that there are a number of exceptions to this generalization. In Proverbs 3: 11–12 it is recorded: 'My child, do not despise the Lord's discipline or be weary of his reproof, for the Lord reproves him whom he loves, as a father the son in whom he delights', the clear implication being that human suffering is analogous to the chastisement of a wayward child by a loving parent (Young, 2000: 688). The prophet Hosea (Hosea 11) also describes how God will not let wrath have the final word and that, in the end – usually interpreted as life after

death – his love will prevail (Hanson and Hanson, 1981, p. 124). Some biblical authors go even further and question the morality of any theodicy that permits the innocent to suffer through the exercise of Divine wrath in order to punish the guilty (e.g. Psalm 44: 8–11, 17–26; Lamentations 2: 20; and 5: 20–22 – see Barton and Bowden, 2004, pp. 87–88), while disquiet is sometimes expressed over the unfairness that allows the wicked to prosper, while injury and death befall the apparently sinless (e.g. The Book of Job and Psalm 73: 3–5 and 12).

Within the Epistles of the New Testament the most significant treatment of the issue of a greater good is the discussion of a passage from the Old Testament Book of Proverbs (Proverbs 3: 11–12) by the anonymous author of the Epistle to the Hebrews (Young, 2000, p. 688). In Hebrews 12 the Greek word παιδεία (*paideia*), which is usually translated as discipline, has traditionally been interpreted as implying rebuke or punishment and so has been used to support a theodicy of *retribution*, but παιδεία may also have the sense of ‘positive teaching and training that loving parents will give their children in a whole range of circumstances’ to bring them to maturity (Peterson, 1994, p. 1349, also see Hebrews 12: 11).

This theme of suffering having a moral purpose is taken further in the first Epistle of Peter (1 Peter 4: 12–19). Here suffering occurs, inter alia, to prove the reality of faith, to share Christ’s suffering and to glorify God (Wheaton, 1994, p. 1382), and over the centuries there are many instances of monks and ascetics inflicting suffering on themselves as a means of spiritual discipline. For the theologian John Hick (1978) suffering is a learning experience and a process of ‘soul-making’, which also involves showing ‘God’s glory’ in ‘compassionate love and self-giving for others [and this] constitutes the highest value of all’ (Young, 2000, p. 688).

Reflecting on these and other passages Austin Farrer, one of the comparatively few 20th century theologians who have been concerned with natural perils as opposed to suffering caused to humans by humans, sums up the *best*

of all possible worlds theodicy using two memorable and oft repeated quotations.

If an earthquake shakes down a city, an urgent practical problem arises – how to rescue, feed, house and console the survivors, rehabilitate the injured, and commend the dead to the mercy of God; less immediately, how to reconstruct in a way which will minimize the effects of another disaster. . . . The will of God expressed in this event is his will for the physical elements in the earth’s crust or under it: his will that they should go on being themselves and acting in accordance with their natures (Farrer, 1966, pp. 87–88).

It is not, then, that the humanly inconvenient by-products of volcanic fire are cushioned or diverted; it is not that all harms to man are prevented. It is that the creative work of God never ceases, that there is always something his Providence does, even for the most tragically stricken (Farrer, 1966, p. 90).

Within historical earthquakes and volcanic eruptions many examples of the use of a *best of all possible worlds* theodicy may be found. For example, two small earthquakes struck London on 8 February and 8 March 1750 and, although the majority of clergy preached a theodicy of divine wrath visited on the sinful people of Britain, one group believed that only some earthquakes were sent to punish, while a third – albeit a small minority – group adopted a *best of all possible worlds* position (Kendrick, 1956, pp. 15–19). In the 19th century, preaching on the occasion of a national day of fasting in 1832, Bishop Maltby of Chichester in England castigated those who saw the hand of providence in all manner of calamities (Anon., 1832), while the reactions of the majority of clergy to earthquakes later in the century were strongly based on explanations grounded in an acceptance of natural processes; the earthquakes in Venice (Italy) in 1873 and Colchester (England) in 1884 being good examples (Table 3).

Reactions of Christian clergy and laity to more recent earthquakes and volcanic eruptions have

often reflected the twin elements contained within the writings of Austin Farrer (1966), of recognizing such events as the outcomes of natural processes, while at the same time seeing them as calls to intercessory prayer for victims and for Christian social action. There are many examples of intercessory prayer listed in Table 4 and Christian help for victims of disasters goes back to New Testament times when severe famine occurred in Palestine. This took place during the reign of Claudius and the apostles sent disaster relief to fellow Christians living in Judea (Acts 11: 29–30).¹⁰ This tradition of charity has continued and has been a feature of reactions to many historic and contemporary earthquakes and volcanic eruptions (Tables 3 and 4). Under both a *retributive* and a *best of all possible worlds* theodicy, Christian praxis is justified by the commandment to love one's neighbour (Matthew 22: 34–40; Mark 12: 29–31) and by seeing the suffering of Christ in the distress of the disaster victims (Matthew 25: 31–46).

There is a danger, however, with Christians adopting a *best of all possible worlds* theodicy and this is highlighted in a thoughtful and highly critical review of a conservative evangelical inspired manual on disaster relief entitled, *Christian Perspectives on Disaster Management* by Davis and Wall (1992). In his review, Hugo Slim (1994) makes the important point that following a disaster there is a danger when the greater good is narrowly defined as the opportunities that may arise if relief aid is used as a means of assisting the process of conversion, because such a perspective comes perilously close to the concept of a 'good' disaster, far removed from the greater good as discussed above (Chester, 1998, p. 490 and Chester and Duncan, 2010).

5. Paradigm shifts and post-Leibnizian theodicy

In the early 1970s research on disasters was mainly carried out under the banner of what has been termed the *dominant* approach which sought to emphasize the deployment of scientific and technological interventions to mitigate the effects of natural calamities (Hewitt, 1983). This

approach was first introduced by Gilbert White in the 1940s to study flooding in the USA and was later extended to embrace other hazards across a wide range of countries. The theological study of natural perils was focused exclusively within the Leibnizian tradition, where the *best of all possible worlds* model had become progressively more prominent over the preceding two centuries (Chester, 1998, 2005a). Paradigm shifts occurred in both academic fields at approximately the same time, starting in the 1980s and gathering momentum in the 1990s, these final ten years of the millennium coinciding with the United Nations' International Decade for Natural Disaster Reduction (IDNDR).

In the case of research on disasters, the *dominant* approach became the subject of trenchant criticism, which is spelt out in detail in studies by Hewitt (1983, 1997), Susman et al. (1983), Alexander (2000), Wisner et al. (2004) and Chester (2005b). Briefly, the *dominant* approach accepted that factors such as differences in systems of beliefs, material wealth, previous experience of hazardous events and psychological factors may be of importance in affecting human responses; it nevertheless emphasized the role of environmental extremes as the principal determinants of disasters. In contrast, by the final decades of the 20th century greater weight was being placed on human vulnerability. It was argued cogently and with increasing force that most of the mortality and morbidity in disasters, especially in ELDCs, could be explained by factors such as poverty, deprivation, marginalization, lack of disaster preparedness and, in the case of earthquakes, by collapsing buildings constructed to inadequate or non-existent codes. For instance, in the 20th century around 99 per cent of volcano-related deaths occurred in ELDCs (Tanguy et al., 1998), while examination of the impacts of earthquakes of similar magnitude showed a similar disparate pattern, with major death tolls increasingly becoming the preserve of the world's poor, whereas financial losses were the most striking feature of 'rich' countries. When financial impacts are expressed as percentages of national wealth (i.e. Gross Domestic

Product, or GDP), however, then the relative economic toll in 'poor' countries is far higher (Chester, 2005b). Here there are clear parallels between the *best of all possible worlds* model and Austin Farrer's ideas quoted above (Farrer, 1966, pp. 87–90) because, as Professor N. N. Ambraseys pointed out many years ago, what are considered 'Acts of God today, are often tomorrow's acts of criminal negligence' on the part of builders, architects or planners (Ambraseys, 1972, p. 40).

For theodicy the paradigm shift has been even more significant because the Leibnizian tradition, which represents over 2,000 years of theological reflection on the relationships between God, natural processes and human suffering, has been largely superseded. A minority of theologians have either continued to work with and/or defend the Leibnizian approach (Table 1; Whitney, 1985, 2003), but from the 1980s the majority found the models summarized in Table 1 increasingly unconvincing and constructed new post-Leibnizian theodicies which required both a renewed engagement with scripture and intense theological reflection on disasters.

There are several strands to this new theodicy. First, as has already been noted when the collapse of the Tower of Silo'am was discussed earlier in the paper, Jesus introduces the notion that guilt may be collective and not individual. Jesus also teaches that punishment was not arbitrarily visited on the individuals who perished, because they were no more to blame than other people living in Jerusalem (Luke 13: 4–5), and there are numerous historical examples where this theme of collective responsibility is mentioned by Christians but not fully developed. In 1382, for example, Archbishop Courtenay called a meeting of the Council in Blackfriars (London) to decide what action to take against the Oxford theologian John Wycliffe and his followers, the 'Lollards', who were seeking to reform the church and were thereby threatening church order (see Table 3 and Carpenter, 1971, p. 74). The occurrence of the 1382 earthquake encouraged some bishops to believe that God disapproved of the institutional church and its

planned actions against Lollardy, but Archbishop Courtenay stood firm and drew the opposite conclusion, that the earthquake was a sign which supported the *status quo*.

Know you not that the noxious vapours which catch fire in the bosom of the earth and give rise to these phenomena which alarm you, lose all their force when burst forth? In like manner, by rejecting the wicked from our community we shall put an end to the convulsions of the church (quoted by de Boer and Sanders, 2005, p. 68).

Another example of guilt being collective rather than personal emerges from John Wesley's reflections on the Lisbon earthquake.

For Wesley the earthquake represented divine retribution for the sins of the Inquisition, but this idea of human sinfulness – institutional rather than individual and ecclesiological, and stripped of its retributive and sectarian overtones – may be a more important insight than was recognized either at the time or subsequently (Chester, 1998, p. 487).

A second strand in post-Leibnizian theodicy emphasizes the immanence of God within human affairs. Terrence Tilley (1991), for instance, argues that the Leibnizian approach is a means of reducing human responsibility for both natural and human-induced suffering because it focuses responsibility on God rather than people: on creator rather than creature. This line of argument may also be seen in the work of two highly influential writers: the Jesuit Raymund Schwager (1987), who shows how there is both a biblical and historical tendency within Christianity to make God the scapegoat for all manner of human failings; and Ted Steinberg, a secular historian of the environment who, in reviewing disasters in the USA, argues that the perception of such events as being caused by either a malign nature or by God are convenient devices for both commercial interests and institutions of government who can thereby evade responsibility for the poor, the racially disadvantaged and other marginalized groups

within American society (Steinberg, 2000; and see Chester and Duncan, 2010, for additional examples).

By combining notions of collective guilt, structural (i.e. institutional) sinfulness and human responsibility, it has proved possible to propose a *liberationist* theodicy (Chester, 1998). This involves a re-working of the 'classic' Leibnizian *free-will* defence, with human freedom not only being expressed at the level of the individual but also collectively, as greed at the national, international and corporate levels. This 'structural sinfulness', so it is argued, lies behind global differences in wealth and power, as well as dissimilar and unequal disaster outcomes. Structural sinfulness was also identified by the *liberation theologians* of the 1970s and 1980s, where it was viewed as a process which keeps the poor and disadvantaged in a state of subjection (Boff, 1979; Gutiérrez, 1988). Beginning with the 1970 earthquake in Peru and especially in South America, there has also been intense theological reflection on earthquake losses (Table 4 and Sobrino, 2004).

A third strand in post-Leibnizian theodicy stresses the immanence of God over divine transcendence, with the crucifixion of Jesus and the doctrine of the Trinity being seen as critically important. According to *liberationist* theodicy, Jesus Christ the 'crucified God' demonstrates how God suffers vicariously with and for all his children (Moltmann, 1974, 1981; Boff, 1988). In the view of Jürgen Moltmann, 'to think of God as impassible would surely be to fall short of the God revealed in Jesus Christ, a God of love who participates in the sufferings of his creatures and is perhaps the greatest sufferer of all' (Macquarrie, 2003, p. 46). The doctrine of the Trinity is invoked to demonstrate how God shares, not only in the suffering of his son on the cross of Calvary but also with all suffering humanity, who are linked to God by a shared parenthood (Sölle, 1984; Pinnock, 2002, p. 133).

A *liberationist* theodicy is finally a partial theodicy, because the probability of disaster losses cannot be wholly eliminated. Even in best planned society people still suffer (see Chester

and Duncan, 2010 for examples). In this, albeit small, minority of cases, recourse has to be made either to the 'classic' Leibnizian models (Table 1), or to a re-working of one or more of them. One free-will approach which is highly germane to people living in hazard-prone regions in economically more developed parts of the world has recently been proposed by Frank Murphy (2005). Murphy argues that in such countries people often make a free choice – either informed or uninformed – to live in an earthquake- or eruption-prone location and, since God cannot foresee their decision, she/he cannot prevent suffering caused when disaster strikes. For example, the elderly Harry Truman's well-documented action in 1980 not to heed warnings to evacuate his property on the flanks on Mount St Helens was his uninformed choice (Rosen, 1981), whereas the informed choice would have been to follow the advice of authorities and so reduce his vulnerability.

6. Conclusions: Moving forward

In studying evacuations carried out in connection with a range of disasters, David Alexander (2002, p. 154) has pointed out that no plan is likely to be 100 per cent successful, but for Christians the reasons for the instructions of the civil authorities being resisted are unlikely to be religious. Reasons may be individualist – as in the example of Harry Truman quoted above – or collective, as in the case of the resistance of inhabitants living on the flanks of Furnas volcano on São Miguel Island in the Azores. In this predominantly agricultural and strongly Catholic area a study of probable reactions of the people to a future eruption uncovered a resistance to evacuate which was based on a strong attachment to land, farm and pedigree livestock herds built up over several generations. Religious beliefs were not an important factor (Chester et al., 1999, p. 203). Also the fact that the city of St Pierre on Martinique in the Caribbean was not evacuated in advance of the 1902 eruption in spite of the increasingly threatening activity of Mount Pelée

volcano had little to do with religion, but rather reflected the Governor's desire not to postpone an imminent election and the fact that a previous eruption in 1851 had merely covered St Pierre with a thin layer of ash (de Boer and Sanders, 2002, pp. 197–198, see Table 4). Many conservative voters lived in St Pierre and the Governor did not want any of them to leave.

One feature to emerge from the study of the eruptions and earthquakes listed in Table 4, and many other events over the course of the past century, is that Christian belief has neither inhibited more practical measures being taken to reduce hazard exposure, nor has it prevented people from accepting help from the civil authorities. Believing in two mutually incompatible explanations, or holding one view yet acting contrary to it, is often termed *parallel practice*¹¹ and this is a particular feature of many closely studied responses in societies with a popular Catholic ethos. For example in southern Italy there is no evidence to suggest that strong adherence to the rituals and beliefs of popular Catholicism has prevented people from obeying the authorities over such measures as evacuation, the behaviour being a good example of individuals hedging their bets. It is also notable that many individuals are rational in understanding the risk faced by neighbouring communities, but not when assessing their own risks (Dibben, 1999, 2008; Chester et al., 2008). Even when people have embraced a *retributive* theodicy, there is additionally no evidence that outside help has been resisted.

As argued in more detail elsewhere (Chester and Duncan, 2010), when the occurrence of *parallel practice* is combined with a post-Leibnizian *liberationist* theodicy and new more vulnerability-focused approaches to hazards, it is possible to see synergies developing. Civil defence planners can more easily make use of the often substantial financial and human resources of Christian denominations and their associated charities. Virtually every community in a country with a Christian history has a church, which is not only a religious focus but a social one, with clergy acting as a useful 'resource' in identifying

victims and providing counselling, relief and leadership (Alexander, 2002, p. 123). Under a *liberationist* approach, the presence of the divine is located in disaster victims and is not perceived as being within the geological processes that caused the earthquake or volcanic eruptions; and this new perspective is already informing Christian attitudes towards disaster relief, being enthusiastically embraced by international Christian charities which seek to provide disaster relief and assist economic development (Keonig, 2006; Moss, 2008; CAFOD, 2009).

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Notes

1. 'Among contemporary philosophers, it is widely agreed that the core logical problem of theodicy concerns the apparent incompatibility of the following triad of propositions: (1) God is perfectly good; (2) God is omnipotent; and (3) evil exists' (Pinnock, 2002, p. 3). In this paper no distinction is made between a theodicy and a defence. A theodicy is a rationale for divine action, while a defence has the more modest apologetic intention of refuting arguments against the existence of God because of the occurrence of human suffering (Chester, 1998, p. 488).
2. All Biblical quotations are taken from the New Revised Standard Version (NRSV), copyright 1989, Division of Christian Education of the National Council of the Churches of Christ in the United States of America. Used by permission. All rights reserved. Note. The usual Hebrew word for earthquake is *ra'ash*, but *charad* – meaning for a mountain to tremble or quake – is also used.
3. In this paper and following current academic practice the abbreviation BCE (Before Common Era) is used in place of BC (Before Christ). CE (Common Era) is used in place of AD (Anno Domini), in the year of the Lord – or after Christ. In archaeology and the earth sciences the timescale BP (Before Present) is commonly used. Standard practice is to

use the year 1950 CE as the arbitrary origin of the scale.

4. The divine speeches that form the *denouement* of the Book of Job have been interpreted in widely contrasting ways. Some commentators have 'argued that they simply ignore Job's claims... and portray a "blustering deity" who crushes Job into abject and humiliating submission'. At the opposite end of the critical spectrum other biblical scholars have maintained that the speeches solve the problem of innocent suffering 'by declaring that in reality the world is "amoral" and so a world in which it is absurd to expect a fate corresponding morally to one's deeds' (Nicholson, 1995, p. 79; see also Clines, 1989, p. 291).
5. *Pseudepigrapha* are a group of Jewish writings composed between the 3rd century BCE and the end of the 2nd century CE. They are frequently ascribed to a famous historical or legendary figure. They are neither included in the Old Testament nor in the *Apocrypha* (e.g. books found in the Greek version of the Old Testament – the *Septuagint* – but not in the Hebrew Bible). English translations of the most important *pseudepigrapha* may be found in Sparks (1984) and Charlesworth (1985a,b).
6. In Christian theology, eschatology is the study of beliefs concerning future and final events. A theophany is a manifestation of God.
7. Whether this was due to collapse, an earthquake, poor workmanship or some other cause is unknown (Buchanan, 2003).
8. Both John Wesley and his brother Charles wrote extensively on earthquakes (C. Wesley, 1750; J. Wesley, 1750). This included the publication of an earthquake hymn book (Wesley, 1756).
9. The term 'biblical literalist' is used in preference to 'fundamentalist' because the latter term lacks precise definition (see Ferguson and Wright, 1988, pp. 267–268).
10. The reign of the Emperor Claudius lasted from 41–54 CE and during this time the Roman historian *Suetonius* confirms the occurrence of drought in Judea (Carson et al., 1994).
11. Believing in two mutually incompatible explanations, or holding one view yet acting contrary to it, is termed *parallel practice* or sometimes *cognitive dissonance* in hazard studies. In psychology and religious studies *cognitive dissonance* has a more restrictive definition (Carroll, 1990, pp. 123–124) and for this reason *parallel practice* is used in the present paper.

References

- Aberth, J., 2001. *From the Brink of the Apocalypse: Confronting Famine, War, Plague and Death in the Later Middle Ages*. Routledge, New York, USA and London, UK.
- Alexander, D., 2000. *Confronting Catastrophe*. Terra Publishing, Harpenden, UK.
- Alexander, D., 2002. *Principles of Emergency Planning and Management*. Terra Publishing, Harpenden, UK.
- Alvarado-Induni, G., 1993. *Costa Rica: Land of Volcanoes*. Gallo Pinto Rica, Costa Rica.
- Ambraseys, N. N., 1972. Earthquake hazard and emergency planning. *Build International* (January–February). 38–42.
- Anderson, T. and Fleet, J. S., 1903. Report on the eruptions of Soufriere in St Vincent, in 1902 and on a visit to Montagne Pelée in Martinique. *Transactions of the Royal Society of London*, 200A. 353–553.
- Anon., 1832. Sermons on the fast day. *The Times (London)*, 22 March. 3.
- Anon., 1873. The Pope and the earthquake. *The Times (London)*, 18 July. D5.
- Anon., 1905. The Italian earthquake: the King and the suffering. *The Times (London)*, 12 September. E3.
- Anon., 1906. The earthquake in South America. *The Times (London)*, 20 August. A and B3.
- Anon., 1907. The earthquake: one thousand persons reported killed. *The Times (London)*, 18 January. A–E4.
- Anon., 1908. The earthquake. *The Times (London)*, 30 December. A–C3.
- Anon., 1909. The earthquake: requiem mass at Westminster Cathedral. *The Times (London)*, 8 January. C4.
- Anon., 1915a. Earthquake in Italy. *The Times (London)*, 14 January. E8.
- Anon., 1915b. Victims of the earthquake. *The Times (London)*, 16 January. B and C9.
- Anon., 1930a. Italy: vengeance of Providence. *Time Magazine*, 14 August. www.time.com/time/magazine/article/0,9171,739995,00.html.
- Anon., 1930b. The earthquake in Italy. *The Times (London)*, 30 July. E11e.
- Anon., 1931. Nicaragua: end of a capital. *Time Magazine*, 13 April. www.time.com/time/magazine/article/0,9171,752790-3,00.html.
- Anon., 1940. Rumania: quake and answer. *Time Magazine*, 18 November. www.time.com/time/magazine/article/0,9171,777519,00.html.
- Anon., 1943. *Palestine and Transjordan*. Naval Intelligence Division, British Admiralty, London, UK.
- Anon., 1949. Ecuador: death in the Andes. *Time Magazine*, 15 August. www.time.com/time/magazine/printout/0,8816,888066,00.html.

- Anon., 1951. The Philippines: tragedy at Hibok-Hibok. *Time Magazine*, 17 December. www.time.com/time/magazine/article/0,9171,859453,00.html.
- Anon., 1960. Deluge. *Daily Mirror*, 28 May. 9.
- Anon., 1970. Infernal thunder over Peru. *Time Magazine*, 15 June. www.time.com/time/magazine/article/0,9171,909375,00.html.
- Anon., 1976. Italy: starting out on a journey of no return. *Time Magazine*, 17 May. www.time.com/time/magazine/article/0,9171,945600-1,00.html.
- Anon., 1980. Death touches every family in Balvano. *The Times (London)*, 25 November. A and B7.
- Anon., 2002. *DR Congo's Endless Suffering*. BBC News, London, UK. news.bbc.co.uk/1/hi/world/africa/1780540.stm.
- Anon., 2003a. *Police response to disaster: Tangiwai*. NZ History. www.nzhistory.net.nz/culture/police-response-to-disaster.
- Anon., 2003b. *Tangiwai Railway Disaster*. NZ History. www.nzhistory.net.nz/Gallery/Tangiwai/index.html.
- Armas, I., 2006. Earthquake risk perception in Bucharest, Romania. *Risk Analysis*, 26(5). 1223–1234.
- Ashby, R., 2007. Bishop's comments on flood and lifestyles. *Church Times*, 27 July. D12.
- Baltodano, A. P., 2004. Transforming the idea of God is an urgent task in Nicaragua. *Revista Envio*, 277 (Agosto). www.envio.org.ni/articulo/2315.
- Bankoff, G., 2004. In the eye of the storm: the social construction of the forces of nature and the climatic and seismic construction of God in the Philippines. *Journal of Southeast Asian Studies*, 35(1). 91–111.
- Banzon-Bautista, C., 1996. The Mount Pinatubo disaster and the people of Central Luzon. *Fire and Mud: Eruptions and lahars of Mount Pinatubo*, C. G. Newhall and R. S. Punongbayan (eds). Philippines Institute of Volcanology and Seismology, Quezon City, Philippines and University of Washington Press, Seattle, WA, USA. 151–161.
- Barbour, I. G., 1990. *Religion in the Age of Science*. SCM, London, UK.
- Barton, J. and Bowden, J., 2004. *The Original Story: God, Israel and the World*. Darton, Longman and Todd, London, UK.
- Bassnett, S., 2006. Faith, doubt, aid and prayer: the Lisbon earthquake of 1755 revisited. *European Review*, 14(3). 321–328.
- Bauckham, R., 1977. The eschatological earthquake in the Apocalypse of John. *Novum Testamentum*, 19(3). 224–233.
- Belshaw, C. S., 1951. Social consequences of the Mount Lamington eruption. *Oceania*, 21(4). 241–252.
- Ben-Menahem, A., 1995. A concise history of mainstream seismology: origin, legacy, and perspectives. *Bulletin of the Seismological Society of America*, 85(4). 1202–1225.
- Bentor, Y. K., 1989. Geological events in the bible. *Terra Nova*, 1(4). 326–338.
- Blong, R. J., 1984. *Volcanic Hazards: A Sourcebook on the Effects of Eruptions*. Academic Press, Sydney, Australia.
- Bode, B., 1977. Disaster, social structure, and myth in the Peruvian Andes: the genesis of an explanation. *Annals of the New York Academy of Sciences*, 293. 246–274.
- Boff, C., 1979. *Theology and Praxis*. Orbis Books, Maryknoll, NY, USA.
- Boff, L., 1988. *Trinity and Society*. Orbis Books, Maryknoll, NY, USA.
- Bosworth, R. J. B., 1981. The Messina earthquake of 28 December 1908. *European Studies Review*, 11. 189–206.
- Bowker, J., 1970. *Problems of Suffering in the Religions of the World*. Cambridge University Press, Cambridge, UK.
- Bradford, B., 2005. Why does God allow disasters? *The Good News*, 10(2). 4–7, 10. www.gnmagazine.org/issues/gn57/gn05ma.pdf.
- Bright, J., 1960. *A History of Israel*. SCM, London, UK.
- Bruce, V., 2001. *No Apparent Danger – The True Story of Volcanic Disaster at Galeras and Nevado del Ruiz*. Harper Collins, New York, NY, USA.
- Buchanan, G. W., 2003. The Tower of Siloam. *The Expository Times*, 115(2). 37–45.
- Burnet, G., 1725. *Bishop Burnet's History of his Won Time: From the Restoration of Charles II, to the Treaty of Peace at Utrecht, in the Reign of Queen Anne* (1840 edn). W. Smith, London.
- Burns, W. E., 2002. *An Age of Wonders: Prodigies, Politics and Providence in England 1657–1727*. Manchester University Press, Manchester, UK.
- CAFOD, 2009. *Focus on Reducing the Threat of Natural Disaster*. <http://www.cafod.org.uk/about-us/what-we-do/climate-change/natural-disasters>.
- Carpenter, E., 1971. *Cantuar. The Archbishops and their office*. Cassell, London, UK.
- Carroll, R. P., 1990. Cognitive dissonance. *A Dictionary of Biblical Interpretation*, R. J. Coggins and J. L. Houlden (eds). SCM, London. 123–124.
- Carson, D. A., France, R. T. J., Motyer, J. A. and Wenham, G. J. (eds), 1994. *New Bible Commentary, 21st Century Edition*. InterVarsity Press, Leicester, UK.
- Charlesworth, J. H. (ed.), 1985a. *Old Testament Pseudepigrapha and the New Testament*, Vol. 1. Cambridge University Press, Cambridge, UK.

- Charlesworth, J. H. (ed.), 1985b. *The Old Testament Pseudepigrapha: Expansions of the 'Old Testament' and Legends, Wisdom and Philosophical Literature, Prayers, Psalms and Odes, Fragments of Lost Judeo-Hellenistic Works*, Vol. 2. Doubleday, New York, USA.
- Chester, D. K., 1998. The theodicy of natural disasters. *Scottish Journal of Theology*, 51(4). 485–505.
- Chester, D. K., 2005a. Theology and disaster studies: the need for dialogue. *Journal of Volcanology and Geothermal Research*, 146(4). 319–328.
- Chester, D. K., 2005b. Volcanoes, society and culture. *Volcanoes and the Environment*, J. Marti and G. J. Ernst (eds). Cambridge University Press, Cambridge, UK. 404–439.
- Chester, D. K., 2008. The effects of the 1755 Lisbon earthquake and tsunami on the Algarve region, southern Portugal. *Geography*, 93(2). 78–90.
- Chester, D. K. and Duncan, A. M., 2007a. Geomythology, theodicy and the continuing relevance of religious worldviews on responses to volcanic eruptions. *Living Under the Shadow*, J. Grattan and R. Torrence (eds). Left Coast Press, Walnut Creek, CA, USA. 203–334.
- Chester, D. K. and Duncan, A. M., 2007b. Lieutenant-Colonel Delmé-Radcliffe's report on the 1906 eruption of Vesuvius, Italy. *Journal of Volcanology and Geothermal Research*, 166. 204–216.
- Chester, D. K. and Duncan, A. M., 2010. Coping with disasters within the Christian tradition, with reference to volcanic eruptions and earthquakes. *Religion*, (submitted).
- Chester, D. K., Dibben, C., Coutinho, R., Duncan, A. M., Cole, P. D., Guest, J. E. and Baxter, P. J., 1999. Human adjustments and social vulnerability to volcanic hazards: the case of Furnas Volcano, São Miguel, Açores. *Volcanoes in the Quaternary. Geological Society Special Publication 161*, C. R. Firth and W. J. McGuire (eds). Geological Society, London, UK. 189–207.
- Chester, D. K., Duncan, A. M. and Dibben, C. R. J., 2008. The importance of religion in shaping volcanic risk perceptions in Italy, with special reference to Vesuvius and Etna. *Journal of Volcanology and Geothermal Research*, 172(3–4). 216–228.
- Chester, D. K., Duncan, A. M., Guest, J. E., Johnston, P. A. and Smolenaars, J. J. L., 2000. Human response to Etna Volcano during the Classical Period. *The Archaeology of Geological Catastrophes. Geological Society of London Special Publication 171*, W. J. McGuire, D. R. Griffiths, P. L. Hancock and I. Stewart (eds). Geological Society, London, UK. 179–188.
- Chester, D. K., Duncan, A. M., Wetton, P. and Wetton, R., 2007. Responses of the Anglo-American military authorities to the eruption of Vesuvius, March 1944. *Journal of Historical Geography*, 33. 168–196.
- Clapperton, C. M., 1973. Thrice threatened Heimaey. *Geographical Magazine*, 45 (April). 495–500.
- Clines, D. J. A., 1989. The wisdom books. *Creating the Old Testament: The Emergence of the Hebrew Bible*, S. Bigger (ed.). Basil Blackwell, Oxford, UK. 269–291.
- Crenshaw, J. K., 1983. *Theodicy in the Old Testament*. Oxford University Press, Oxford, UK.
- Crenshaw, J. K., 2005. *Defending God*. Oxford University Press, Oxford, UK.
- Cunningham, A. and Grell, O. P., 2000. *The Four Horsemen of the Apocalypse: Religion, War, Famine and Death in Reformation Europe*. Cambridge University Press, Cambridge, UK.
- Darwin, C., 1859. *On the Origin of Species by Means of Natural Selection; or, The Preservation of Favoured Races in the Struggle for Life*. John Murray, London, UK.
- Davies, P., 2007. The history of ancient Israel and Judah. *The Expository Times*, 119(1). 15–21.
- Davis, I. and Wall, M., 1992. *Christian Perspectives on Disaster Management*. Tear Fund and the Interchurch Relief and Development Alliance, London.
- Davis, S. T. (ed.), 1981. *Encountering Evil: Live Options for Theodicy*. Atlanta: John Knox Press.
- Dean, D. R., 1979. The influence of geology on American literature and thought. *Two Hundred Years of Geology in America*, C. J. Schnee (ed.). University Press of New England, Durham, NH, USA. 289–303.
- de Boer, J. Z. and Sanders, D. T., 2002. *Volcanoes in Human History*. Princeton University Press, Princeton, NJ, USA.
- de Boer, J. Z. and Sanders, D. T., 2005. *Earthquakes in Human History*. Princeton University Press, Princeton, NJ, USA.
- Degg, M., Shuffelbotham, E. and Doornkamp, J., 2000. *Earthquake Hazard Atlas 1* (2nd edn). Israel. International Underwriting Association of London, London, UK.
- de Silva, P., 2006. The tsunami and its aftermath in Sri Lanka: explorations of a Buddhist perspective. *International Review of Psychiatry*, 18(3). 281–287.
- Dibben, C. R. J., 1999. Looking beyond eruptions for an explanation of volcanic disasters: vulnerability in volcanic environments. Unpublished Ph.D. thesis. University of Luton, Luton, UK.
- Dibben, C. R. J., 2008. Leaving the city for the suburbs – the dominance of 'ordinary' decision making over volcanic risk perception in the production of volcanic risk on Mt. Etna, Sicily. *Journal of Volcanology and Geothermal Research*, 172(3–4). 288–299.
- Dobson, M. and O' Shaughnessy, L. N., 1990. *Nicaragua's Other Revolution. Religious Faith and Political*

- Struggle*. University of North Carolina Press, Chapel Hill, NC, USA and London, UK.
- Dow, G., 2007. God's will, human lifestyle, and natural disasters. *Church Times*, 20 July. 11.
- Drane, J., 1987. *Introducing the Old Testament*. Lion Books, Oxford, UK.
- Dynes, R. R., 2000. The dialogue between Voltaire and Rousseau on the Lisbon earthquake: the emergence of a social science view. *International Journal of Mass Emergencies and Disasters*, 8(1). 97–115.
- Dynes, R. R., 2005. The Lisbon earthquake of 1755: the first modern disaster. *The Lisbon Earthquake of 1755: Representations and Reactions*, T. E. D. Braun and J. B. Radner (eds). Voltaire Foundation, London, UK. 34–49.
- Dynes, R. R. and Yutzy, D., 1965. The religious interpretation of disasters. *Journal of the Liberal Arts*, Fall. 34–47.
- Emerson, B. K., 1896. Geological myths. *Science*, IV(89). 328–329.
- Farrer, A., 1966. *A Science of God*. Bles, London.
- Ferguson, S. B. and Wright, D. F. (eds), 1988. *The New Dictionary of Theology*. Inter-Varsity Press, Leicester, UK.
- Fountain, P. M., Kindon, S. L. and Murray, W. E., 2004. Christianity, calamity and culture: the involvement of Christian churches in the 1998 Aitape tsunami disaster relief. *Contemporary Pacific*, 16(2). 321–355.
- Fradkin, P. L., 2005. *The Great Earthquake and Firestorms of San Francisco. How San Francisco Nearly Destroyed Itself*. University of California Press, Berkeley, CA, USA.
- Frankl, V. E., 1959. *Man's Search for Meaning*. Bles, London, UK.
- Fuller, M., 1907. Notice on the Jamaica earthquake. *Journal of Geology*, 57(Oct–Nov). 696–721.
- Furnham, A. and Brown, L. B., 1992. Theodicy: a neglected aspect of the psychology of religion. *International Journal for the Psychology of Religion*, 2(1). 37–45.
- Gaillard, J.-C., 2003. Territorial and ethno-cultural implications of a volcanic crisis: the case of Mount Pinatubo eruption. *Alaya: Kapampangan Research Journal*, 1. 83–88.
- Gaillard, J.-C., 2006. Traditional societies in the face of natural hazards: the 1991 Mt. Pinatubo eruption and the Aetas of the Philippines. *International Journal of Mass Emergencies and Disasters*, 24(1). 5–43.
- Geipel, R., 1982. *Disaster and Reconstruction*. George Allen and Unwin, London, UK.
- Gragg, L., 2000. The Port Royal Earthquake. *History Today*, September. 28–34.
- Grattan, J., Brayshay, M. and Schüttenhelm, R. T. E., 2002. The end is nigh? Social and environmental responses to volcanic gas pollution. *Natural Disasters and Cultural Change*, R. Torrance and J. Grattan (eds). Routledge, London and New York. 87–106.
- Gutiérrez, G., 1988. *A Theology and Liberation*. Orbis Books, Maryknoll, NY, USA.
- Haining, P., 1976. *The Great English Earthquake*. Robert Hale, London, UK.
- Hanska, J., 2002. *Strategies of Sanity and Survival. Religious Responses to Natural Disasters in the Middle Ages. Fennica Historical 2*. Finnish Literature Society Studio, Helsinki, Finland.
- Hanson, A. T. and Hanson, P. C., 1981. *Reasonable Belief: A Survey of the Christian Faith*. Oxford University Press, Oxford, UK.
- Harris, G. H. and Beardow, A. P., 1995. The destruction of Sodom and Gomorrah: a geotechnical perspective. *Quarterly Journal of Engineering Geology*, 28. 349–362.
- Hartley, W., 1983. Saints and the San Francisco earthquake. *Brigham Young University Studies*, 23(4). 431–459.
- Healey, M. A., 2002. The fragility of the moment: politics and class in the aftermath of the 1944 Argentine earthquake. *International Labor and Working-Class History*, 62. 50–59.
- Heilprin, A., 1903. *Mont Pelée and the Tragedy of Martinique*. Lippincott, Philadelphia, PA, USA.
- Hewitt, K., 1983. *Interpretations of Calamity*. Allen and Unwin, London, UK.
- Hewitt, K., 1997. *Regions of Risk. A Geographical Introduction to Disasters*. Longman, London, UK.
- Hick, J. E., 1973. *Philosophy of Religion* (2nd edn). Prentice-Hall, Englewood Cliffs, NJ, USA.
- Hick, J. E., 1978. *Evil and the Love of God*. Harper and Row, San Francisco, CA, USA.
- Howell, B. F., 1990. *An Introduction to Seismological Research: History and Development*. Cambridge University Press, Cambridge, UK.
- Huggins, J., Cunningham, R. and Panton, J., 1997. *Submission from Christian Aid and the Montserrat Aid Committee to the Committee on International Development of the House of Commons*. Christian Aid and the Montserrat Aid Committee, London, UK.
- Ingleby, I., 1966. Mount Lamington fifteen years later. *Australian Territories*, 6. 23–34.
- Jaggard, T. A., 1937a. Trends in the philosophy of science. *Volcano Letter*, 447. 2–6.
- Jaggard, T. A., 1937b. Eruptions at Rabaul, New Guinea. *Volcano Letter*, 448. 2–6.
- Jeffrey, P., 2001. El Salvador: when the Earth shakes, it's the poor who suffer. *New Outlook (Mission Magazine of the United Methodist Church)*, July/August. gbgm-umc.org/nwo/01ja/elsalvador.html.

- Johnson, R. W. and Threlfall, N. A., 1985. *Volcano Town. The 1937–43 Rabaul Eruptions*. Robert Brown and Associates, Bathurst, Australia.
- Kempe, M., 2003. Noah's flood: the Genesis story and natural disasters in early modern times. *Environment and History*, 9, 151–171.
- Kendrick, T. D., 1956. *The Lisbon Earthquake*. Methuen, London, UK.
- Koenig, H. G., 2006. *In the Wake of Disaster: Religious Response to Terrorism and Catastrophe*. Templeton Foundation Press, Philadelphia, PA, USA and London, UK.
- Kovach, R. L., 2004. *Early Earthquakes of the Americas*. Cambridge University Press, Cambridge, UK.
- Krinitzsky, E. L., 2005. Earthquakes and soil liquefaction in flood stories of the ancient Near East. *Engineering Geology*, 76(3–4), 295–311.
- Leibniz, G. W. von, 1712. *Essais de Théodicée sur la bonté de Dieu, a la liberté de l'homme et l'origine du mal*. Microfilm Research Publications, New Haven, CT, USA.
- Leibniz, G. W. von, 1952. *Theodicy*. A. Farrer (ed.), E. M. Huggard (trans.). Routledge and Kegan Paul, London, UK.
- Levenson, D., 2002. Reactions to trauma: The 1976 earthquake in Guatemala. *International Labor and Working-Class History*, 62(Fall), 60–68.
- Lewis, C. S., 1944. *The Problem of Pain*. Bles, London, UK.
- Lewis, C. S., 1961. *A Grief Observed*. Faber, London, UK.
- Lyell, C., 1830. *Principles of Geology*. John Murray, London, UK.
- MacDonald-Ross, G., 1984. *Leibniz*. Oxford University Press, Oxford, UK.
- Macquarrie, J., 2003. *Stubborn Theological Questions*. SCM, London, UK.
- Magnusson, E., 1985. A noise like thunder. *Time Magazine*, 30 September. www.time.com/time/magazine/article/0,9171,959981,00.html.
- Mariottini, C. F., 1990. Earthquake. *Mercer Dictionary of the Bible*. Mercer University Press, Macon, GA, USA. 223.
- Maxwell, K., 2007. The Jesuit and the Jew. *Revista (Harvard Review of Latin America)*, 17(7 Winter), 17–18.
- Moltmann, J., 1974. *The Crucified God: The Cross of Christ as the Foundation and Criticism of Christian Theology*. SCM, London, UK.
- Moltmann, J., 1981. *The Trinity of the Kingdom of God*. SCM, London, UK.
- Moltmann, J., 1983. Theodicy. *A New Dictionary of Christian Thought*, A. Richardson and J. Bowden (eds). SCM, London, UK. 564–566.
- Moss, S., 2008. *Christian Aid and Disaster Risk Reduction*. Humanitarian Practice Network. odihpn.org/report.asp?id=2892.
- Murphy, F. J., 2005. Unknowable world: solving the problem of natural evil. *Religious Studies*, 41, 343–346.
- Musson, R. M. W., 1994. *A Catalogue of British Earthquakes*. Technical Report WL/04/04. British Geological Survey, Edinburgh, UK.
- Neev, D. and Emery, K. O., 1995. *The Destruction of Sodom, Gomorrah and Jericho*. Oxford University Press, Oxford, UK.
- Newhall, C. G. and Punongbayan, R. S., 1996. The narrow margin of volcanic-risk mitigation. *Monitoring and Mitigation of Volcanic Hazards*, R. Scarpa and R. I. Tilling (eds). Springer-Verlag, Heidelberg, Germany. 807–838.
- Nichols, P., 1985. Moments of madness when the world falls apart. *The Times (London)*, 23 September. A–E11.
- Nicholson, E. W., 1995. The limits of theodicy as a theme of the book of Job. *Wisdom in Ancient Israel*, J. Day, R. P. Gordon and H. G. N. Williamson (eds). Cambridge University Press, Cambridge, UK. 71–82.
- Nissenbaum, A., 1994. Sodom, Gomorrah and the other lost cities of the plain – a climatic perspective. *Climatic Change*, 26, 435–446.
- Nolan, M. L., 1979. Impact of Parícutin on five communities. *Volcanic Activity and Human Ecology*, P. D. Sheets and D. K. Grayson (eds). Academic Press, New York, NY, USA. 293–338.
- Nur, A., 1991. And the walls came tumbling down: Old Testament writings of doom and destruction are now providing researchers with a record of earthquakes spanning 4000 years. *New Scientist*, 6 July. 45.
- Nur, A. and Burgess, D., 2008. *Apocalypse: Earthquakes, Archaeology and the Wrath of God*. Princeton University Press, Princeton, NJ, USA.
- Pareschi, M. T., Boschi, E. and Favalli, M., 2007. Holocene tsunamis from Mount Etna and the fate of Israeli Neolithic communities. *Geophysical Research Letters*, 34, L16317. doi:10.1029/2007GL030717.
- Pattullo, P., 2000. *Fire from the Mountain: The Tragedy of Montserrat and the Betrayal of its People*. Constable, London, UK.
- Penick, J. L., 1981. *The New Madrid Earthquake*. University of Missouri Press, Columbia, MO, USA.
- Perret, F. A., 1924. *The Vesuvius Eruption of 1906: Study of a Volcanic Cycle*. Carnegie Institution Publication, Washington, DC, USA.
- Perret, F. A., 1950. *Volcanological Observations*. Carnegie Institution of Washington, Washington, DC, USA.
- Peterson, D. G., 1994. Hebrews. *New Bible Commentary*, D. Carson, R. T. France, J. A. Motyer and G. J. Wenham (eds). Inter-Varsity Press, Leicester, UK. 1321–1353.

- Pinnock, S. K., 2002. *Beyond Theodicy: Jewish and Christian Continental Thinkers Respond to the Holocaust*. State University of New York Press, New York, NY, USA.
- Plant, R., 1978. *Guatemala: Unnatural Disaster*. Latin America Bureau, London, UK.
- Plantinga, A., 1974. *God, Freedom and Evil*. Harper and Row, New York, NY, USA.
- Plunket, P. and Urnuela, G., 1998. Appeasing the volcano gods – ancient altars attest a 2,000 year-old veneration of Mexico's smouldering Popocatepetl. *Archaeology*, 51(4). 36–42.
- Pringle, P., 1976. Report. *The Sunday Times*, 8 February. F–H9.
- Rigg, J., Law, L., Tan-Mullins, M. and Grundy-Warr, C., 2005. The Indian Ocean tsunami: socio-economic impacts in Thailand. *The Geographical Journal*, 171(4). 374–379.
- Rosen, S., 1981. *Truman of St. Helens: The Man and His Mountain*. Madrona Publishers and Longview Publishing, Seattle, WA, USA.
- Russell, C. A., 1994. *The Earth, Humanity and God*. UCL Press, London, UK.
- Rutherford, M. S. and Roux, G. M., 2002. Health benefits and practices in rural El Salvador. An ethnographic study. *Journal of Cultural Diversity*, 9(1). 3–11.
- Sachs, J. S., 1979. Some aspects of the early history of seismology. *Earthquake Information Bulletin*, 11. 58–63.
- Sagav, M., 1979. The interface between earthquake planning and development planning: a case study and critique of the reconstruction of Huaraz and Callejon de Huaylas, Ancash, Peru. *Disasters*, 3(3). 258–263.
- Scarth, A., 1999. *Vulcan's Fury: Man against the Volcano*. Yale University Press, New Haven, CT, USA and London, UK.
- Scarth, A., 2002. *La Catastrophe: Mount Pelée and the Destruction of Saint-Pierre, Martinique*. Terra Press, Harpenden, UK.
- Scarth, A. and Tanguy, J.-C., 2001. *Volcanoes of Europe*. Terra Publishing, Harpenden, UK.
- Schwager, R., 1987. *Must There Be Scapegoats?* (trans. M. L. Assad; German edn 1978). Harper and Row, San Francisco, CA, USA.
- Schwimmer, E. G., 1969. *Cultural Consequences of a Volcanic Eruption Experienced by Mount Lamington, Orokaiva. Report 9*. Department of Anthropology, University of Oregon, Washington, DC, USA.
- Shea, M. E., 2001. *Culture and Customs of Guatemala*. Greenwood Press, Westport, CT, USA.
- Sigurdsson, H., 1999. *Melting the Earth*. Oxford University Press, Oxford, UK and New York, NY, USA.
- Simkin, T., Siebert, L., McClelland, L., Bridge, D., Newhall, C. and Latter, J. H. (eds), 1981. *Volcanoes of the World*. Smithsonian Institution, Washington, DC, USA.
- Slim, H., 1994. 'Christian Perspectives on Disaster Management' by Davis and Wall (review). *Disasters* 18(2). 194.
- Smith, G. A., 1896 (1966 reprint). *The Historical Geography of the Holy Land*. Collins Fontana Library, London, UK.
- Smithsonian, 2008. *Large Holocene Eruptions*. www.volcano.si.edu/world/largeeruptions.cfm.
- Smoller, L. A., 2000. Of earthquakes, hail, frogs, and geography: plague and the investigation of the Apocalypse in the Later Middle Ages. *Last Things. Death and the Apocalypse in the Middle Ages*. University of Pennsylvania Press, Philadelphia, PA, USA. 156–187.
- Sobrinho, J., 2004. *Where is God: Earthquake, Terrorism, Barbarity and Hope*. Orbis Group, New York, NY, USA.
- Sölle, D., 1984. *Suffering* (trans. E. R. Kalin). Fortress Press, Philadelphia, PA, USA.
- Sparks, H. F. D., 1984. *The Apocryphal Old Testament*. Oxford University Press, Oxford, UK.
- Stauffer, E., 1955. *Christ and the Caesars: Historical Sketches*. SCM Press, London, UK.
- Steinberg, T., 2000. *Acts of God: The Unnatural History of 'Natural' Disasters in America*. Oxford University Press, New York, NY, USA.
- Sugirtharajah, R. S., 2006. Surfing the scriptures after the tsunami. *Theology*, CIX(851). 323–333.
- Susman, P., O'Keefe, P. and Wisner, B., 1983. Global disasters, a radical interpretation. *Interpretations of Calamity*, K. Hewitt (ed.). Allen and Unwin, London, UK. 263–283.
- Tanguy, J.-C., Ribière, C., Scarth, A. and Tjetjep, W. S., 1998. Victims from volcanic eruptions. *Bulletin of Volcanology*, 60(2). 137–144.
- Thomas, K., 1971. *Religion and the Decline of Magic*. Weidenfeld and Nicolson, London, UK.
- Tiedemann, H., 1992. *Earthquakes and Volcanic Eruptions*. Swiss Reinsurance Company, Zurich, Switzerland.
- Tilley, T. W., 1991. *The Evils of Theodicy*. Georgetown University Press, Washington, DC, USA.
- Tobin, G. A. and Whiteford, L. M., 2002. Community resilience and volcano hazard: the eruption of Tungurahua and evacuation of the faldas in Ecuador. *Disasters*, 26(1). 28–48.
- Trifonov, V. G., 2007. The Bible and geology: destruction of Sodom and Gomorra. *Geological Society of London Special Publication*, 273. 133–142.
- Tyrrell, G. W., 1931. *Volcanoes*. Home University Library, London, UK.

- USGS (United States Geological Survey), 2008. *Earthquakes with 1,000 or More Deaths Since 1900*. earthquake.usgs.gov/regional/world/world_deaths.php.
- Viveros, A., 2000. *Rebuilding Post-Earthquake Colombia. Bank Approves \$225 Million for Recovery Effort*. World Bank, Washington, DC, USA. web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/LACEXT/0,contentMDK.20020094~menuPK:258569~pagePK:2865106~piPK:2865128~theSitePK:258554,00.html.
- Wesley, C., 1750. Thursday April 5th. *Journal*. wesley.nnu.edu/charles_wesley/journal/1750a.htm.
- Wesley, J., 1750. The cause and cure of earthquakes – Sermon CXXIX. *The Works of John Wesley*. Vol. VII. Zondervan, Grand Rapids, MI, USA. 386–399.
- Wesley, J., 1755. Serious thoughts occasioned by the late earthquake at Lisbon. *The Works of John Wesley*. Vol. XI. Zondervan, Grand Rapids, MI, USA. 1–13.
- Wesley, J., 1756. *Hymns Occasioned by the Earthquake, March 8 1750: To Which is Added an Hymn upon the Pouring out of the Seventh Vial . . . Occasioned by the Destruction of Lisbon* (Part 1). E. Farley, Bristol, UK.
- Wheaton, D. H., 1994. 1 Peter. *New Bible Commentary, 21st Century Edition*, D. A. Carson, R. T. France, J. A. Motyer and G. J. Wenham (eds). Inter-Varsity Press, Leicester, UK. 1369–1385.
- Whitney, B. L., 1985. *Evil and the Process God*. E. Mellen Press, New York, NY, USA.
- Whitney, B. L., 2003. *Anti Theology: Is Theodicy Itself Evil?* www.mnsi.net/~bwhitney/blw-7theodicy-1d.html.
- Williamson, H. G. N., 2007. The history of Israel – or; twos into one won't go. *The Expository Times*, 119(1). 22–26.
- Winchester, S., 2006. *A Crack in the Edge of the World: The Great American Earthquake of 1906*. Penguin Books, London, UK.
- Wisner, B., Blaikie, P., Cannon, T. and Davis, I., 2004. *At Risk: Natural Hazards, People's Vulnerability and Disasters*. Routledge, London, UK.
- Worcester, D. C., 1912. Taal volcano and its recent destructive eruption. *National Geographic Magazine*, 23(4). 313–367.
- Young, F., 2000. Suffering. *The Oxford Companion to Christian Thought: Intellectual, Spiritual, and Moral Horizons of Christianity*, A. Hastings, A. Mason and H. Pyper (eds). Oxford University Press, Oxford, UK. 687–689.